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ABSTRACT

GRADES OR AGES: K-12. SUBJECT MATTER: Mathematics. ORGANIZATION AND PHYSICAL APPEARANCE: The guide is divided into three sections, one each for elementary grades, middle grades, and high school. Each section is further subdivided by grade level. Sections are laid out in four columns across two pages. Column headings are concepts, teaching methods and learning activities, resources, and evaluation. The guide is mimeographed and loose-leaf bound with a soft cover. OBJECTIVES AND ACTIVITIES: General objectives are outlined in an introductory section. Suggested activities are correlated with specific mathematical concepts and specific objectives. Most of the activities in middle grades and high school consist of working problems in textbooks. INSTRUCTIONAL MATERIALS: Material needed for an activity are listed with the activity description. Most materials listed for the middle grades and high school are page references in textbooks. STUDENT ASSESSMENT: Suggestions for evaluation accompany each group of activities correlated with a concept--usually teacher observation in the lower grades and teacher-developed and textbook quizzes in the upper grades. (RT)

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K - 12 MATHEMATICS

Curriculum Guide

1968-1969

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FORWARD

The publication of this Curriculum Guide represents the culmination of a year of study. The final editorial work was carried out by six teams of teachers during the summer of 1968. These materials were prepared under the supervision of Mr. Ronald A. Hilvers, Director of Instruction.

Teachers are encouraged to refer constantly to this guide during planning sessions throughout the year. It should be understood that any resource material cannot be the final answer to instructional questions, but rather a tool to direct the thinking process of the teacher. Periodically this guide will be updated. In order to facilitate this process teachers should write in suggested changes, additions, or deletions in the spaces left for this purpose. Particular attention should be paid to sections of the guide which outline expected outcomes. By paying attention to these objectives, the teacher should be better able to design and evaluate an effective program for the children.

The Reading Community Schools
Reading, Ohio
September, 1968

PHILOSOPHY

MATH

The primary function of the modern mathematics program is to develop in students the ability to apply numbers and number operations intelligently and skillfully, and the ability to use quantitative procedures effectively in social situations both in and out of school.

The material in a modern mathematics program should be structured to follow a logical sequence of presentation, which leads to the most useful generalizations. Pupils should be encouraged to develop the skill of reaching generalizations without teacher assistance.

Each pupil should develop to the fullest extent of his mathematical capabilities. To achieve this the individual needs of each pupil, whether college preparatory or vocational, should be satisfied. These needs will be met by offering as extensive and wide a variety of mathematical experiences as the pupil can successfully complete.

Within these philosophical guidelines the Reading Community Schools offer this Mathematics Curriculum guide.

EDUCATIONAL OBJECTIVES

1. Provide for independent study to promote originality, creativity, and thus revealing the uniqueness of the individual learner.

2. Provide for the changing role of the teacher. This involves a move from a dispenser of information role to the role of a catalyst whose prime obligation is the stimulation of the urge to inquire and the oversight of individual independent study.

3. Recognize the worth of the individual student by enabling him to select the subject matter. This will develop appreciation and a favorable attitude toward the subject.

4. Provide for small groups and thus teacher-pupil interaction.

5. Begin a resource center accumulation taped lessons, records, word sheets, individual texts, etc.

6. Provide for the student and understanding of the mathematically oriented, complex world in which he functions.

7. Provide the student with the mathematic skills to enable him to further his education or to function as a productive individual in society.

8. In addition to #6 and #7, to strive for the possession in each student mathematic concepts, meaning and problem solving abilities.

9. Stress the analytical approach in the study of mathematics.

FLOW CHART
Concepts of Arithmetic

			Elementary					Middle			Secondary		
Year	K	1	2	3	4	5	6	7	8	9	10	11	12
Readiness	+ -	+ -	+ - x ÷	x ÷	x ÷	x ÷							
Whole Numbers		+ -	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷			+ - x ÷
Introduction to Fractions		X	X	X	X	X	X	X	X				
Operations with Fractions				+ -	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷			+ - x ÷
Introduction to Decimals						X	X	X	X				
Operations with Decimals							+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷			+ - x ÷
The Integers					+	+ -	+ -	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷	+ - x ÷
Modular Arithmetic								X	X	X			X
Different Number Bases								X	X	X			X
Commutative, Associative, & Distributive Properties		a, c	a, c	a,c,d	a,c,d	a,c,d	a,c,d	a,c,d	a,c,d	a,c,d	a,c,d	a,c,d	a,c,d
Identity Elements		X	X	X	X	X	X	X	X	X	X	X	X
Place Value		X	X	X	X	X	X	X	X	X	X	X	X
Sets	X	X	X	X	X	X	X	X	X	X	X	X	X
Measurement	X	X	X	X	X	X	X	X	X	X	X	X	X
Percentage							X	X	X	X	X	X	X

FLOW CHART
Concepts of Geometry

	Elementary						Middle				Secondary		
Year	K	1	2	3	4	5	6	7	8	9	10	11	12
Recognition of Figures	X	X	X	X	X	X	X	X	X		X	X	X
Construction							X	X	X		X	X	X
Area				X	X	X	X	X	X		X	X	X
Volume					X	X	X	X	X		X	X	X
Inductive & Deductive Reasoning											X	X	X
Parallel & Perpendicular Lines				X	X	X	X	X	X		X	X	X
Polygons			X	X	X	X	X	X	X		X	X	X
Circles & Arcs	X	X	X	X	X	X	X	X	X		X	X	X
Loci											X	X	X
Ratio & Proportion									X		X	X	X
Inequalities											X	X	X
Coordinate Geometry											X	X	X

FLOW CHART

Concepts of Algebra

	Elementary						Middle			Secondary			
Year	K	1	2	3	4	5	6	7	8	9	10	11	12
Symbols						X	X	X	X	X	X	X	X
Mathematical Sentences		X	X	X	X	X	X	X	X	X	X	X	X
Polynomials									X	X	X	X	X
Special Products & Factoring									X	X	X	X	X
Algebraic Fractions										X	X	X	X
Graphing					X	X	X	X	X	X	X	X	X
The Real Number System											X	X	X
Function & Relation										X	X	X	X
Quadratic Equations											X	X	X
Logarithms											X	X	X
Progressions											X	X	X
Binomial Expansions											X	X	X
Matrices & Determinants											X	X	X
Permutations, Combinations & Probability											X	X	X

FLOW CHART
Concepts of Advanced Math

			Elementary					Middle			Secondary		
Year	K	1	2	3	4	5	6	7	8	9	10	11	12
Trigonometry													
Functions of Angles												X	X
Graphs of Functions												X	X
Complex Numbers												X	X
Vectors												X	X
Fundamental Relations												X	X
Polar Coordinates												X	X
Solution of Triangles												X	X
Analytic Geometry													
Slope & Tangents													X
Equation of Straight Lines													X
Distance Between Two Points													X
Conic Sections													X
Parametric Equations													X

FLOW CHART
Concepts of Advanced Math

			Elementary					Middle			Secondary		
Year	K	1	2	3	4	5	6	7	8	9	10	11	12
Calculus													
Functions													X
Limits													X
Derivatives													X
Applications of Derivatives													X
Integration													X
Applications of the Definite Integral													X
Transcendentals													X

READING COMMUNITY SCHOOLS

CURRICULUM GUIDE

MATHEMATICS

ELEMENTARY

Concepts	A) Teaching Methods B) Learning Activities
Mathematics-Kindergarten Geometry:Figures -Investigating spheres, cubes, circles, squares, rectangles, and triangles -Investigating how figures are alike and how they are different -Recognizing same shape: spheres, cubes, circles, squares -Investigating repeating patterns: shape Time: approx. 5 days	A) Introduce assorted sizes and colors of the various geometric figures. Permit children to manipulate, visualize and compare the difference in sizes and shapes. B) Through investigation the children find that spheres and cubes do not look or feel the same.
Sets -Identifying the members of a set -Making sets of objects -Matching the members of two sets to see if one has just as many members as the other -Making a set that has just as many objects as a given set Time: approx. 3-4 days	A) Introduce the set by placing different toys in three boxes. Each box should contain different toys and different numbers of toys Explain that each toy is a member of the set; set is the collection of the toys. B) Use flannel board, yarn, and cut outs to demonstrate how to make sets, comparison of sets and one-to-one matching of sets. The children should be actively involved in the manipulation of the objects and also to see a set with no objects.
Whole Numbers: 0 through 6 -Investigating sets that have the same number of members: zero through six -Associating the name with the number -Recognizing a pattern arrangement for a number of objects -Arranging objects in a pattern to see if there are a given number of objects in a set -Perceiving sets that have the same number Time: approx. 5-6 days	A) Create a situation in which students have an opportunity to investigate sets that have the same number of members. The investigation should include visual recognition, hearing pattern of sounds, feeling the pattern tapped on hand or shoulder. B) 1. Clapping of hands. Each clap indicates a number 1=1 clap 2. Display cutouts on flannel board. Have children use yarn to enclose set. 3. Have students place different objects in boxes or containers to demonstrate the idea of matching objects in any given set.

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Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 1 Teacher's Manual 1-16 G.C.M.P., latest revision pp. 1-10 B) Masking tape Balls(assorted sizes) Blocks " " Spheres " " Rectangular Blocks Wooden chalk boxes Flannel board Flannel discs	A) Children demonstrate the ability to recognize the different geometric figures B) Teacher Observation
A) Greater Cleveland Math Program Unit 2 Teacher's Manual 16-27 G.C.M.P., Worksheets pp. 11-18 B) Toys Boxes Wrapping paper Masking Tape Yarn Flannel Board Flannel Cut-outs Tagboard Cut-outs	A) Students exhibit the ability to identify the member of a set, making of a set and matching of members of two sets. B) Anecdotal Records Teachers judgment
A) Greater Cleveland Math Program Unit 3 Teacher's Manual 27-43 G.C.M.P., Worksheets pp. 19-30 Key Topics in Mathematics for Elementary Teachers SRA B) Flannel board Felt cut-outs Yarn Picture cards showing 1,2,3,etc. Objects Pins Boxes or plastic containers Several unrelated objects Large box	A) Children are able to recognize how many objects are in a set for sets having zero through six members B) Teacher judgment Observation

Concepts	A) Teaching Methods B) Learning Activities
Order Relation: 0 through 6 -Matching members of sets to determine which set has more members -Recognizing a set that has just one more member than a given set -Arranging sets so that each has one more member than the preceding set -Investigating the natural order of whole numbers through six -Counting the objects in a set of six -Using numbers through six to identify the position of an object in a row Time: approx. 2 days	A) Have children match the objects in two sets to decide which set has just one more object than the other. Then they use these decisions to help them arrange sets in order so each set has just one more object than the preceding set. B) Play games to help children know the order of whole numbers 1. Children form a circle by sitting around six large paper squares which have been glued to the floor. On the 1st square put a star and explain that this is square #1. Have students bounce the ball on each square the number of times that will correspond to that number of square. Have children illustrate poems that relate to the order of the whole numbers from 1-6 For example see Teacher's Manual pp. 53
Readiness for Addition -Separating a set of six or less objects into two parts -Identifying the number of a set and the number of each part of the set -Investigating sets of six or less objects to find ways to separate them into two parts -Naming the number of objects in a set as a sum of the numbers of objects in the parts Time: approx. 3-4 days	A) Provide opportunity for students to investigate the number of objects in a partitioned set and discover several sums associated with each number of objects B) 1. Use flannel board and cutouts to demonstrate how a set of six of less objects nay be separated into two parts 2. Display set of three blocks Separate into two parts by students 3. Have students separate beads on a string or wire into two parts Refer to Teacher's Manual pp. 54, 65

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 4 Teacher's Manual 43-53 G.C.M.P., Worksheets pp. 31-34 Key Topics in Mathematics for Elementary Teachers SRA B) Yarn Flannel Board and Cutouts Cards showing 0-6 objects Beadframe Pegboard and Pegs	A) Pupils demonstrate the ability to do oral counting from 0-6 and to find the right position of a numeral B) Teacher should observe and take notes as she works with the pupils
A) Greater Cleveland Math Program Unit 5 Teacher's Manual 54-65 G.C.M.P. Worksheets pp. 35-42 B) Flannel board Flannel sut-outs Blocks Domino cards Heavy wire rod Wooden beads Counting beads	A) Students are able to separate a set of objects into two parts and to name the number of objects in a set as a sum of the number of objects e.g. Three is one plus two B) Teacher observation and taking of notes on performance of students

Concepts	A) Teaching Methods B) Learning Activities
Geometry: Shape and Size -Identifying figures that have the same shape and size: circles, squares. -Identifying the larger circle and the larger square - Testing for same shape: rectangles -Identifying the larger rectangle of two that have the same shape -Testing for same shape: triangles -Identifying the larger triangle of two that have the same shape _Arranging figures in order according to size: circles, squares Time: approx. 1-2 days	A) Present the different geometric shapes. Guide children in their investigation of the shapes and their comparative size. Use the flannel board and cut-outs to illustrate the desired concepts B) Permit pupils to manipulate the concrete objects to strengthen their understanding Refer to Teacher's Manual pp. 65-72
Whole Numbers: 7 through 12 -Investigating sets that have the same number of members: seven through twelve -Associating the name with the number -Recognizing a pattern arrangement for a number of objects -Arranging objects in a pattern to see if there are a given number of objects in a set -Perceiving sets that have the same number Time: approx. 6-7 days	A) Use counting objects for the numbrals 7-12. Compare the number of objects in each set. Refer to Teacher's Manual pp. 72-89 B) Provide opportunities for pupil to make sets with counting objects and to compare their set with another set Use rhythmic counting to music and display the numeral that corresponds with the count.
Order Relation: 0 through 12 -Matching members of sets to determine which set has more members -Recognizing a set that has just one more member than a given set -Arranging sets so thet each set has one more member than the preceding set -Investigating the natural order of whole numbers through twelve -Counting the objects in a set of twelve -Using numbers through twelve to identify the position of an object in a row Time: approx. 3-4 days	A) Review the conceptthat 7 is 1 more than 6, etc. for 7-12. Have children compare sets of objects with each set containing 1 more than the previous set Introduce the new words: eighth, ninth, tenth, B) Cutout a tagboard doghouse and fix it so it will adhere to the flannel board. Place doghouse on flannel board and use yarn to make twelve steps leading to doghouse Make 12 different colored tagboard puppies. Give one puppy to 12 children. Have the students place the brown dog on the 1st step, the red dog on the 3rd step etc, thus,stressing the position or order of the steps Refer to Teacher's Manual pp. 89-96

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 6 Teacher's Manual 65-72 G.C.M.P., Worksheets pp. 43-46 B) Concrete objects of circle, square rectangles and triangles (These should be of various sizes) Flannel Board Flannel cut-outs of rectangles, squares, circles, and triangles	A) Children demonstrate the ability to identify the basic geometric shapes and their comparitive sizes Children develop an awareness of the role of geometric figures in everyday life B) Visual testing of students
A) Greater Cleveland Math Program Unit 7 Teacher's Manual 72-89 G.C.M.P., Worksheets pp. 47-60 B) Small counting objects as colored cubes, dolls or other distinctive toys Flannel board and numeral cut-outs 4by6 cards with the numerals 7-12	A) Pupils acquire the ability to associate the name of a number with the numeral Students are able to compare sets and distinguish between those that have the same number of objects and those which have less or more B) Observation Anecdotal Records
A) Greater Cleveland Math Program Unit 8 Teacher's Manual 89-96 G.C.M.P., Worksheets pp.61-64 B) Flannel Board and cut-outs Bead frame and beads Large objects to illustrate sets	A) Pupils develop the ability to work with the sequence of numbers from 1-12 B) Teacher Observation Progress made on worksheets or oral work

Concepts	A) Teaching Methods B) Learning Activities
Numerals for Numbers: 0 through 6 -Recognizing the number of objects in a set having 0 through 6 -Associating a numeral with the number of objects in a set -Choosing a numeral to tell how many objects in a set -Making a set of objects to show the number told by a given numeral -Arranging sets of objects and numerals in order: 0 through 6 Time: approx. 6-7 days	A) Introduce the numerals 0-6 by placing felt numerals on the flannel board. Beside each numeral display a card showing the # of objects which correspond to the numeral displayed. Say the word as the numerals and picture cards are displayed. B) Provide many opportunities for the children to see, hear and touch the numerals 0-6
Another View of Addition -Separating a set of six or less objects into two parts -Naming the number of objects in a set as a sum of the numbers of objects in the parts -Selecting two sets to make a set having just as many members as a given set -Investigating the number of objects in a part of a set when the number in the set and the number in the other part are known Time: approx. 2-3 days	A) Display sets of objects which children can partition into 2 sets. Guide the children in an investigation to find several ways to express the number of objects in a set. Example: 3 is one plus two 3 is two plus one 1 plus 2 is three
Numerals for Numbers: 7 through 12 -Recognizing the number of objects in a set having 7-12 members -Associating a numeral with the number of objects in a set -Choosing a numeral to tell how many objects are in a given set: 0-12 -Making a set of objects to show the number told by a given numeral -Arranging sets of objects and numerals in order: 0-12 -Investigating repeating patterns of objects that involve shape, size, and number Time: approx. 8-9 days	A) Provide an opportunity for the pupils to see, feel, say, and hear each numeral as it is introduced. Guide them in their endeavor to find a numeral for a given number of objects. Use concrete objects to help pupil gain knowledge of the numerals 7-12 and their association with sets. Draw upon the pupils previous knowledge of concepts of numerals 0-6 to help broaden their understanding B) Use rhythmic counting to music, clapping, tapping, or jumping rope to give meaning to the numerals

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 9 Teacher's Manual 96-110 G.C.M.P., Worksheets pp. 65-78 B) Flannel Board Felt numerals Felt cut-outs Yarn Cards showing objects 0-6 Refer to Teacher's Manual pp. 96-110	A) The children are able to recognize the symbol for numbers 0-6 and to use these numerals to communicate his ideas relating to the numerals B) Teacher observe the children's ability to recognize and use the numbers 0-6 Worksheets pp. 65-78
A) Greater Cleveland Math Program Unit 10 Teacher's Manual 111-117 B) Pegboard Flannel board Felt cut-outs Felt numerals Concrete objects(such as toys) Materials for making cards with numerals to illustrate additive combinations 2-6	A) Pupils demonstrate the ability to separate a set into two parts, choose numerals that tell the number of objects in the set and in each of its parts Teacher observes if the pupils are able to express orally the number of objects in a set as the sum of the number of objects in each part.
A) Greater Cleveland Math Program Unit 11 Teacher's Manual 117-136 G.C.M.P., Worksheets pp. 79-96 B) Yarn Flannel Board Flannel cut-outs & numerals Numerals from sandpaper Wooden blocks, beads, small toys Cards showing 7-12 objects	A) Pupils recognize and use the numerals 7-12 and orally express their order Students enjoy investigating pattern patterns of numbers B) Appropriate dittos Teacher judgment Skills performed on worksheets pp. 79-96

Concepts	A) Teaching Methods B) Learning Activities
Mathematics-First Year Review- one week Pre-Number: One-to-One Matching -Recognizing and showing sets -Identifying members of a set -Using one-to-one corresponeence Time: approx. 2 days	A) Demonstrate and teach difference between number and numeral Teach names of numerals by recognition Demonstrate proper way of making numerals Show meaning of each numeral by use of sets learned before B) Organize groups of children calling them sets of children Show complete set of children in room, Set of boys. Set of girls. Children in one-to-one correspondence with desks in room Group children with a group of books, pencils, etc.
Numbers and Numerals 1 through 5 -Perceiving the numbers 1 through 5 -Relating numerals to sets having 1 through 5 members -Recognizing and writing numerals for numbers 1 through 5 -Recognizing different numersls for 1 through 5 -Ordering whole numbers 1 through5 Time: approx. 8 days	A) See A) above B) Use picture charts showing objects of each number Children can draw a set of 4, etc. Have children use cut-outs on flannel board to show a set of 5. Children use sticks, pipecleaners etc,to form sets at their seat Give practice at board in forming numbers then forming them on paper Draw a picture illustrating each set
Numbers and Numerals 1 through 7 -Perceiving the numbers 1 through 7 -Relating numerals to sets having 1 through 7 members -Recognizing and writing numerals for 1 through 7 -Recognizing different numerals for 1 through 7 -Ordering whole numbers 1 through 7 Time: approx. 7 days	Refer to activities above

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Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 1 G.C.M.P., Worksheets 1-4 B) Use concrete objects within classroom that are familiar to the children: themselves desk books pencils	A) Demonstrates ability to recognize a set of objects placing them in one to one correspondence B) Observation by teacher Skills demonstrated on work pages in child's book
A) Greater Cleveland Math Program Unit 2 pp. 5-23 G.C.M.P.,Worksheets 5-24 B) Flannel board Counting sticks Cut-outs Board Picture charts Refer to text for other materials 5-23 Teacher's Manual	A) Exhibits ability to recognize numerals and form sets for numerals-Shows ability to form numerals from memory B) Observation of advancements made Skills demonstrated in classroom practice and or work pages in book Ability to use and recognize numerals in classwork as observed by teacher
A) Refer to activities in Unit 2	

Concepts	A) Teaching Methods B) Learning Activities
Numbers and Numerals 1 through 9 -Perceiving the numbers 1 through 9 -Relating numersls to sets having 1 through 9 members -Recognizing and writing numerals for 1 through 9 -Recognizing different numerals for 1 through 9 -Ordering whole numbers 1 through 9 Time: approx. 7 days	Refer to activities, previous page
Numbers and Numerals 1 through 12 -Perceiving the numbers 1 through 12 -Relating numerals to sets having 1 through 12 members -Recognizing and writing numerals for 1 through 12 -Recognizing different numerals for 1 through 12 -Ordering whole numbers 1 through 12 Time: approx. 10 days	Refer to activities, previous page
Geometry-The Number Line -Investigating line segments -Comparing lengths -Associating whole numbers with lengths -Perceiving the meaning of zero -Investigating order using the number line Time: approx. 10 days	A) Review different shapes B) Draw incomplete shapes on board having children complete the segment Draw lines on board having children judge longest and shortest, thus presenting size Give each child strips of construction paper of assorted sizes. Have childern sort into groups of one size. Using these strips have children construct different shapes Example: Make a rectangle. The child must find that he will need 2 long strips and two short strips Make a square-the child must find that he must have 4 strips of the same size.

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Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 111 Teacher's Manual 37-49 G.C.M.P., Worksheets pp. 37-49	
A) Greater Cleveland Math Program Unit V Teacher's Manual 50-73 G.C.M.P., Worksheets pp. 51-70	
A) Greater Cleveland Math Program Unit Vl Teacher's Manual 73-91 G.C.M.P., Worksheets pp. 71-90 B) Strips of colored paper (assorted sizes) Chalkboard Rulers (number line) Contact paper (for number line on floor) Magic Marker	A) Pupils show ability to recognize the shapes of things around them Pupils demonstrate their ability to use the number line to help them compare lengths and to investigate the order of numbers B) Oral identification of the basic geometric shapes Teacher observation and judgment

Concepts	A) Teaching Methods B) Learning Activities
Ordinal Use of Whole Numbers -Using numbers to indicate position -Using the words first through twelfth Time: approx. 2 days	A) Review concept of numerals 1-12 Establish orderof right to left by using flannel board and flannel cut-outs. Assign counting number to each object. Show that numbers may be used to designate objects Ask questions such as: What is number 1? number 3? Change order of objects and continue with questions similar to that above B) Draw large square on black board Mark off into columns with five boxes in each column Have children number the rows from left to right. Have twelve students come to the fromt of the room. Give one child all cards with the numerals 1-12. Have the child give each of the twelve children in front a numeral card- going from left to right. Permit children to take turns doing the activity Do work pages 91-94
Sum Through 5 -Investigating sums as numbers -Investigating sums through 5 -Investigating X as an unspecified number Time: approx. 7 days	A) Use flannel board and cut-outs to demonstrate the joining of two sets Display at top of flannel board numeral cards 0+1 through 11+1 Choose or have a child choose the card that corresponds to the set which has been formed. Discuss the three numbers involved.Explain that a set of three joined to a set of two forms a new set. The number 3+2 is called a sum. Continue in like manner to show other sums. B) Use the bead frame to give practice in joining sets of different colored beads with sums through 5 Draw five houses on the board. Put the numeral 5 in each chimney.Draw windows in from 0-5. Specify number needed to total five Do worksheets pp. 95-108

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit VII Teacher's Manual 92-95 G.C.M.P., Worksheets pp. 91-94	A) Demonstrate the readiness for use of ordinal numbers. Shows ability to use the numbers 1-12 to show position.
B) Flannel board Flannel cut-outs Numeral cards Concrete objects within the classroon such as: Children desks books pencils Blackboard	B) Observation of the achievement on the behalf of the students as to the concepts taught How well the skills are demonstrated in classroom practice on board, worksheets or practice sheets
A) Greater Cleveland Math Program Unit VIII Guide pp. 96-106 G.C.M.P., Worksheets pp. 95-108	A) Students realize the joining of two sets result in a sum of two or more numbers Children exhibit the ability to compute sums through five Demonstrate the ability to find an unspecified number.
B) Flannel board Flannel cut-outs Blocks Toys Children Concrete objects Bead frame Number line Numeral cards Clothes pins	B) Teacher observation of the skills mastered and ability to use the skills on worksheets or in class work.

Concepts	A) Teaching Methods B) Learning Activities
Subtraction -Relating subtraction to addition -Relating sums and differences through 5 Time: approx. 4 days	A) Demonstrate and teach the relationship of subtraction to addition Example: 3+2=5 5-3=2 5-2=3 Introduce the concept of one-less Explain that one less is the inverse or opposite of one more Demonstrate the way to write the equations Explain the term difference B) Have a group of children come to the front of room and join hands. Alternate joining 1 more to the group and one less child. Continue in like manner with sums and differences through five. Children use counters plastic numerals and cards at their desk to build sets and related sentences

A) Printed
B) Audio Visual
Resources C) People
D) Places

A) Greater Cleveland Math Program
Unit IX Teacher's Manual 106-115
G.C.M.P., Worksheets pp. 106-115
Key Topics in Mathematics for Primary Teachers

B) Flannel board
Flannel Cut-outs
Number line
Counters
Plastic numerals and symbols
Word cards with the word "is" on them

A) Expected Outcome
Evaluation B) Testing Program

A) Students demonstrate the ability to use the relationship between addition and subtraction
Pupils are able to complete simple mathematical sentences which relate the relationship between addition and subtraction

B) Test ability of students to read and write addition and subtraction sentence by a simple teacher-made quiz
Children test themselves on the ability to recognize the one-more and one-less patterns
their performance on the worksheet for the teacher's evaluation as well as their own

Concepts	A) Teaching Methods B) Learning Activities
Place Value-Counting Tens -Counting tens to 12 tens -Using numerals for tens through 12 tens (120) -Computing sums and differences of tens through 5 tens -Investigating sums of tens and ones -Using standard numerals for sums of tens and ones -Counting to 120	A) Review meaning of number and numeral Explain the term compute Introduce and demonstrate to the class that it is possible to count by tens as well as ones. this should be done with concrete objects such as sticks, paper sticks, beads, etc. Introduce and show how to form the numerals 10, 20, 30, - 120. B) Have children count objects and place one clothes pin for each object on the chart. When they have ten clothes pins exchange the ten ones for one "ten" pin to be placed on the tens side (preferably another color of pin) Then children are to select the correct numeral card (or may write the numeral on the board) which identifies the number of pins This activity may vary and bundles of sticks, paper strips and beads etc. may be used instead of clothes pins Extend this kind of activity to help children understand counting by tens through twelve tens. Provide opportunity for students to practice writing numerals introduced. Have pupils arrange columns of beads on the bead frame to show sums of multiples of tens. Send some students to the chalkboard to write the algorisms for columns of beads on bead frame as others manipulate the beads. Children compute the algorisms on pp. 117-132

A) Printed
B) Audio Visual
Resources C) People
D) Places

A) Greater Cleveland Math Program
Unit 10, pp. 116-127
G.C.M.P., Worksheets pp. 117-132
Key Topics in Mathematics for Primary Teachers

B) Pocket chart
Bundles of sticks
Bead frame
Counting men
Number kine
Clothes pins
Chart for ten and ones made of cardboard
Numeral cards

A) Expected Outcome
Evaluation B) Testing Program

A) Children demonstrate competence in counting by tens through twelve tens or one hundred twenty
Students display the ability to form and use the numerals for sums of tens and ones

B) Teacher observation of skills manifested.
Pupil performance as indicated by their work on worksheets or practice sheets.

Concepts	A) Teaching Methods B) Learning Activities
Sums of Six and Seven -Investigating sums for 6 and 7 -Relating sums and differences through 7 -Investigating the order of addends -Investigating sums with 3 addends	A) Use method described in Unit 8 for investigation of sums for 6 and 7 See Unit 9-relating sums and differences Review inverse relationship concept Introduce commutative property of addition Example: 5+2=7 law of 2+5=7 order Begin by explaining that commute means to go back and forth; therefore the addends can change their order(or place) without changing the sum Explain that more than two addends are possible work example of column addition on the chalkboard Use concrete materials to review the concept of joining of sets in relation to addition of numbers B) Have children take turns going to the board to practice formation of numerals and formation of numerals and the sums of six and seven Permit children to use the various teaching devices such as: bead frame and beads, ten-frame, cardboard cones, etc. to strengthen their understanding of finding sums

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 11 Teacher's Manual pp. 128-144 G.C.M.P., Worksheets pp. 133-150 Key Topics in Mathematics for Elementary Teachers	A) Students demonstrate the ability to compute sums for six and seven.
B) Flannel board Flannel cut-out Ten frames Cardboard cones Bead frame	B) Observation of advancements made Skills demonstrated on work pages 133-150

Concepts	A) Teaching Methods B) Learning Activities
Sums of Eight and Nine -Investigating sums for 8 and 9 -Relating sums and differences through 9 -Strengthening understanding of the commutative property -Strengthening understanding of the associative property -Strengthening understanding of the closure property -Strengthening understanding of zero Time: approx. 6-8 days	A) Use methods described in Unit for investigation of sums for 8-9. Demonstrate on chalkboard & flannel board the concepts of commutative, associative, closure, and identity property of zero. It is suggested that these be taught on separate days B) Give extensive practice for facts through sums of nine on board and paper Provide opportunity for children to manipulate various concrete materials to help in their investigation of sums of eight and nine Give oral practice of reading equations with the help of visual materials.
Sums of Ten -Investigating sums for 10 -Relating sums and differences through 10 -Reviewing the meaning of 11 through 19 Time: approx. 3-4 days	A) Use 10 objects. Have children arrange in 2 sets. Clearly show that these arrangements of sets are another name for 10 Guide students in understanding the commutative pronciple in writing the addition facts Review the meaning of the numerals 11-19 by oral discussion of the fact that 11 is 1 more than ten or (10+1), etc. B) Give each child 10 objects such as counters. Have the students write the facts, then illustrate. Provide the opportunity for child to work with counters to observe the "undoing" or inverse relationship Example: 3+X=6 6-X=3 Use worksheets pp. 171-180 for practice and display of their skills in computing sums of 10

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 12 Teacher's Manual pp. 145-163 G.C.M.P., Worksheets pp. 151-170 Key Topics in Mathematics for Elementary Teachers SRA B) Chalkboard Flannel Board Flannel cut-outs, symbols and numerals Bead frame and Beads Ten Frame Countingmen	A) Students exhibit the abilitv to compute mathematical equations vertically and horizontally with the sums of eight and nine. Demonstrate through their work the understanding of the different properties taught in this unit B) Teacher-made quiz How well the students use the skills on their worksheets Progress of students as observed by the teacher
A) Greater Cleveland Math Program Unit 13, Teacher's Manual pp. 164-172 G.C.M.P., Worksheets pp. 171-180 Key Topics Mathematics for Elementary Teachers B) Large counting objects Small " " " Flannel Board Flannel cut-outs Number line	A) Pupils show ability to compute the addition combination through 10 Students are able to tell and solve simple mathematics sentence Children display knowledge of the inverse relationship between a addition and subtraction B) Performance demonstrated on daily worksheets and ditto sheets Teacher-made tests through seatwork and oral participation Observation

Concepts	A) Teaching Methods B) Learning Activities
Sums Greater than 10 -Investigating sums for 11 through 20 Time: approx. 9-10 days	A) Help children to visualize the process of addition with sums greater than 10. Those who have difficulty should have additional opportunities to act out, use pictures or concrete objects to gain a better understanding Group class in order to meet specific needs Work specific Problems step by step on the board. B) Drills through games such as "Number Ladder" and Fizz-Buzz Build chart of facts Use counting men for helping the children visualize the concepts. Draw number line of floor. Permit children to explore one more, one less concept
Money -Comparing the value of coins -Using pennies, nickles, and dimes Time: approx. 1 day	A) Exhibit the various coins and orally discuss the comparative value of the coins Guide the children carefully in their recognization of pennies. nickels, and dimes. B) Set up a "play store" in the room. Children will enjoy bringing empty cartons, bottles, etc. to stock their store. Have children practice buying objects with real or play money. Have children draw a line from each coin to the money word that matches it. This may be done on the board or at desks.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 14 pp. Teacher's Manual pp. 172-182 G.C.M.P., Worksheets pp. 181-120 *Key Topics in Mathematics for Elementary Teachers* B) Countingmen Chalkboard White contact paper for number line Magic Marker Concrete objects which may be in classroom	A) Pupils discover the addition facts for sums of 11- 14. It should be noted that the children are not expected to master these facts at this point B) Observation Interest displayed by students Teacher judgment
A) Greater Cleveland Math Program Unit 15 Teacher's Manual pp. 183-183 G.C.M.P., Worksheets pp. 201-202 B) Real money kit (ten pennies, 2 nickels, 1 dime) Toy money Empty cartons, bottles, cans etc, to stock store Cards with numerals labeled with the cent sign(to use as tags for price)	A) Pupils are able to recognize the penny, nickel, and dime. Children are able to count money represented by coins of denominations such as pennies and nickels, or pennies and dimes to find amount of money needed to pay for an object Students acquire the vocabulary pertaining to the coins B) Teacher observation Daily worksheets Ability to pay for objects bought at "play store"

Concepts	A) Teaching Methods B) Learning Activities
Fractional Numbers -Meeting the counting problem -Recognizing the meaning of one half (1/2) -Measuring lengths in inches and half inches Time: approx. 3-5 days	A) Use the flannel board to illustrate fractional parts. Guide pupils in an oral discussion of how fractions apply in daily life such as 1/2 of an apple or pie eaten paper strips 1 1/2 inches long etc. Explain fraction as a "part" B) Pupils fold and cut paper to make fractional parts Children divide objects on the board Permit pupils to divide apples, bananas (just beforelunch) Practice oral conversation involving fractions
Time -Investigating the clock -Telling time to the hour and the half hour -Investigating the calendar (day, week, month) Time: approx. 5 days	A) Use flannel board and clock face to illustrate how to tell time. Give individualized help in telling time. For those who have great difficulty with this concept, it might be suggested that parents give help at night----one-to-one correspondence Guide children through the investigation of the calendar B) Children make their own clock face from a pie plate or cardboard. Guide children in the making of a calendar.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 16 Teacher's Manual pp. 188-194 G.C.M.P.,Worksheets pp. 203-206 B) Fractional discs Flannel board and cut-outs Paper, scissors, ruler Concrete objects such as bananas pies, apples, etc. Egg cartons which may be divided into halves Counters to be divided into 1/2	A) Pupils are able to find 1/2 of an object Children are able to apply their knowledge of fractional parts to everyday living Broaden their vocabulary to include ruler, inch, inches, measure, long, longer, longest, etc. Observation of work in class Teacher-judgment
A) Greater Cleveland Math Program Unit 17 pp. 195-200 G.C.M.P., Worksheets pp. 207-210 B) Wall calendars Cardboard clock face with movable hands Toy clock with synchronized hands Real clock Cardboard material to make a calendar	A) Pupils are able to tell time to the hour and half- hour, record time and develop an awareness of the passage of time-- hours through the days Children are able to associate time with the events of the day Add to their vocabulary o'clock hour hand, minute hand, noon, midnight, and half-past the hour. B) Teacher observation of how accurate the pupils can tell time both orally and in written form

Concepts

Sums of Eleven through Twelve

- Using sums for 10 to investigate sums for 11 and 12
- Using the associative property
- Relating sums and differences for 11 and 12

Time: approx. 7-8 days

A) Teaching Method
B) Learning Activities

A) Use the flannel board or chalk- to illustrate how a set of 8 members and a set of 7 members are joined. Help the children to see that rearranging a set so that they can see a group of ten within helps them to add.

Place three sets in the flannel board-Ask children:
1. How many sets of ten can you find? come & circle
2. What is anothe name for one ten and five ones?
3. Write a number sentence to show our thinking

Review associative property of addition, also combinations of facts whose sums are 10.

B) Provide many opportunities for students to investigate problems whose sums are greater than 10

Use worksheets pp. 211-226 to provide practice for children

Use chalkboard to give opportunity for pupils write math sentences and to demonstrate their skill in using the associative property to help solve simple equations.

Resources
A) Printed
B) Audio Visual
C) People
D) Places

A) Greater Cleveland Math Program pp. 201-210
G.C.M.P., Worksheets pp. 211-226
Key Topics in Mathematics for Elementary Teachers

B) Flannel board & cut-outs
Concrete objects sich as: beads clother pins, buttons, sticks, strips of paper, etc.
Chalkboard
Countingmen
Number line
Material for making cards to show equations such as:
4+9=X or (5+5)+3=13

Evaluation
A) Expected Outcome
B) Testing Program

A) Pupils are able to compute simple equations whose sums are 11 and 12
Children are able to use the associative property to help them find sums greater than 10
Students use the knowledge of our numeration system as based on ten to help them find sums greater than 10

B) Children test themselves on their ability to compute problems whose sums are 11 & 12. They present their work to the teacher for evaluation of their performance

Concepts	A) Teaching Methods B) Learning Activities
Sums of Thirteen and Fourteen -Using sums for 10 to investigate sums for 13 and 14 -Using the associative property -Relating sums and differences for 13 and 14 Time: approx. 9-10 days	A) Start with sets of concrete objects. Help the children regroup these sets and relate the appropriate mathematical sentence to each step of his work. Careful guidance should be used to help the pupils learn to use the thinking steps involved in adding two numbers such as 9 and 4 Help the students discover the interesting patterns by helping them to find that for a given sum, as the first addend becomes less by one, the second addend becomes greater by one. B) Use worksheets 227-246 to help students find patterns Play the game I'm Thinking of a Number to help the children think of numbers. Use number line to help students add and subtract sums greater than ten. (Each child may benefit by his own individual number line-- ruler may be used)
Sums of Fifteen through Eighteen -Using sums for 10 to investigate sums for 15 through 18 -Using the associative property -Exploring patterns in addition combinations -Computing sums of 3 addends Time: approx. 9-10 days	A) Use same method as described for previous Units For other suggested teaching methods see G.C.M.P. guide pages 222-235 B) Use wordsheets pp.247-266 Give students the opportunity to manipulate various concrete objects such as the Ten Frame to help in the development of the harder combinations

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 19 G.C.M.P., Worksheets pp. 211-222 Key Topics in Mathematics for Elementary Teachers B) Countingmen Number line Hundred board Counting objects such as milk bottles caps, buttons and colored sticks Rulers Flash cards and materials for children to make their own. Flannel board and cut-outs	A) Pupils demonstrate the ability to use sums of ten to help them find the sums for thirteen and fourteen Students use their knowledge of the associative property of addition to help them find sums greater than 10 Children exhibit an understanding of the inverse relationship of addition and subtraction B) Skills performed on workpages 227-246 Teacher-make quiz Observation by teacher on classroom work and the ability to use these skills and previous taught ones
A) Greater Cleveland Math Program Unit 20 pp. 222-235 G.C.M.P., Worksheets pp. 247-266 Key Topics of Mathematics for Elementary Teachers B) Pocket chart Tagboard equation cars (for each child) Ten Frame Number line Large pegboard Colored spools	A) The children are able to apply their understanding of the associative, commutative, and one-more, one-less pattern to help them work with combination that result in sums of 15 or 16 Pupil develops an ability to recognize the inverse relationship between addition and subtraction Pupils are able to compute sums of three addends B) Teacher observation Skills performed on worksheets, dittos, or board work Keep individual case records

Concepts	A) Teaching Methods B) Learning Activities
Skip Counting -Counting by tens -Counting by twos -Counting by fives Time: approx. 2-3 days	A) Review the number sequence which begins with 10 and increases by 10 each time or decreases by 10 Review one-by-one counting and the order of the numbers. Help the pupils discover the pattern in each sequence. Use the same method to help with patterns of 10's, 2's and 5's Provide bundles of sticks, each to contain 10 sticks to give children practice in counting by 10's Construct a hundred chart in 24 in. by 36 in tagboard. Discuss the usage of the chart in helping the students find the number sequence or patterns Draw ladders and steps in the board Have the students find the missing terms and write the corresponding numerals on the steps or ladders. (This is best for children to work in small groups or used as relay games)

Resources
A) Printed
B) Audio Visual
C) People
D) Places

A) Greater Cleveland Math Program
Unit 21 Guide pp. 236- 240
G.C.M.P., Worksheets pp. 267-272
Key Topics in Mathematics for Elementary Teachers

B) Bundles of sticks
Sheet of tagboard (24" by 36")
Flannel Board and cut-outs
Concrete objects
Cards
Multiples of 5-100
Counters

Evaluation
A) Expected Outcome
B) Testing Program

A) The pupils are able to skip count by 2's, 5's and 10's
The children exhibit the ability to recognize the number patterns both increasing and decreasing

B) Oral testing
Worksheets

Concepts

Mathematics-Second Year

I. Addition of Whole Numbers
- Union of sets to define addition
- Sums of ten, nine, eight, seven, and six
- Inverse relationship (Informal presentation)
- Missing addend problems
- Column addition- one digit- four numerals
- Computing sums and differences 0-10

Time: approx. 2 1/2 weeks

II. Zeros in Addition
- Using number line to count by 7's
- Using a calendar
- Two-digit addition- no carrying using zero as a place holder

Time: approx. 1 week

A) Teaching Methods
B) Learning Activities

A) Use flannel board or chalkboard to demonstrate the joining of set as a means of finding the sums

Introduce, informally the inverse relationship 2 and 1 is 3
3 less 1 is 2

Make into number sentence:
2 and 1 is___.
3 less 1 is ___.

Work as many examples on the board as necessary for students to grasp the concepts. Have students go to board and work problems. Observe carefully those who need extra help.

Explain how to use a number line by telling students to move to the right for addition to the left for subtraction

B) Use worksheets S1-32 for practice

Permit students to manipulate concrete materials to aid in addition

A) Illustrate with counting sticks in bundles of ten.

Use counting men to demonstrate place value or may use place value charts

Demonstrate using the number line to add multiples of ten.

Review empty set

Explain 30 as no ones and adding of
+40
3 and 4 to find the number of tens

B) Class take turns working examples at the board.

Teacher observation

Use worksheets S 33- 42 for practice

Make ditto sheets for supplementary worksheets

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Second Year, Latest Edition G.C.M.P., Worksheets pp. S1-32 Key Topics in Mathematics for Primary Teachers, SRA	A) Students are able to compute sums of 0-10 Students exhibit an understanding of the inverse relationship between addition and subtraction and are capable of predicting the outcome of a number sentence
B) Number line Counting objects Flannel board Felt numerals and cut-outs Counting sticks Abacus	B) Teacher observation of work of the board Performance on worksheets Teacher-made quiz
A) Greater Cleveland Math Program G.C.M.P.,Worksheets pp. S33-42 Key Topics in Mathematics for Primary Teachers, SRA	A) Pupils demonstrate the ability to compute sums greater than 10- using zero in ones place
B) Counting objects Abacus Number line Countingmen Flannel board & array cut-outs Counting sticks single sticks bundles of sticks	B) Teacher observation Application of gained knowledge to new situations Teacher-made quiz

Concepts	A) Teaching Methods B) Learning Activities
III. Addition and Subtraction Sums and Differences 10-18 -Using sets to find sums and differences -Using number line to complete mathematical sentences -Computing of sums and differences -Story excerises involving addition and subtraction -The addition algorism is developed through the use of array models or sets. -The subtraction algorism is developed through the use of models Time: approx. 2-3 weeks	A) Illustrate examples of problems on the board. Use bundles of sticks and place value charts to help children visualize the thinking process. Let children pretend that erasers or other objects are numerals Let them dramatize number problems Review the concept of inverse relationship Use the number line to illustrate problems $5+7=(5+5)+2$ as a thinking process thus the informal introduction of the associative property Explain how the associative property will help on column addition since addition is a binary process. B) Worksheets pp. 43-94

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program G.C.M.P., Worksheets pp. S43-94 *Key Topics in Mathematics for Primary Teachers*, SRA	A) Students exhibit the ability compute sums and differences of 10-18
B) Flannel board Felt cut-outs Place value chart Countingmen Number line Abacus Bundles of sticks Counting beads Filmstrip "Two Properties of Addition"	B) Daily observation by the teacher Teacher judgment Teacher Test Application of skills on worksheets

Concepts

IV. Two-Digit Addition With Carrying to Tens and Hundreds Place
-Using models to develop the addition algorism
Array models
Number strip

Time: approx. 4-5 days

A) Teaching Methods
B) Learning Activities

A) Have children express essence of the problem.

34 34 and 52 is how many?
+52 34 and 52 is ________?

Emphasize the placement of the sign in the example and the orderly arrangement of the two numerals.

Go from the above type example to one like this:

38=30+8
+54=50+4
80+12 (80+10)+2=________

Explain carefully the regrouping process. Work as many examples as necessary for children to get the concept. Have the children go to the board, work examples & explain the thinking process.

Teacher should observe the students carefully to give additional help when needed.

Use array cut-out model to develop the addition algorism-or may use number strip model.

Use counting men to stress place value and sums of tens and ones.

B) Provide opportunities for students to take turns placing the fingers on the countingmen while another student writes the equation on the board-a third child writes expanded notation and a fourth child computes the sum

Prepare ditto sheets for additional practice to pp. 43-94. Give much oral as well as written practice for this.

Resources
A) Printed
B) Audio Visual
C) People
D) Places

A) Greater Cleveland Math Program
G.C.M.P., Worksheets pp. 95-104
Key Topics in Mathematics for Primary Teachers, SRA

B) Counting men
Place value charts
Counting sticks
Concrete objects
Number line
Abacus
Flannel board and cut-outs

Evaluation
A) Expected Outcome
B) Testing Program

A) Pupils display an understanding of the principles involved in regrouping from ones to tens tens to hundreds
Students are able to compute 2 digit addition with carrying, successfully

B) Self-evaluation by the students
Teacher take notes on students ability to apply their understanding of the principles involved in regrouping to compute problems on worksheets
Teacher Tests

Concepts	A) Teaching Methods B) Learning Activities
V. Measurement -Money Computing sums with money -Linear measurement Using 1/2" to measure length Using 1" to measure length Observing that whole numbers can't be used to answer all the questions about how many or what length -Geometry Comparing lengths of esges of squares, triangles and rectangles. -Recognizing 1/4 and 1/2 of an object Time: approx. 1 week	A) Use real or play money to help students visualize what amount of money they are to compute Discuss money problems orally in class. Work problems step by step Use yardstick or rulers as a computing device to measure things such as their books, pencil, etc. Compare lengths of edges of squares, triangles and rectangles for a class demonstration. Review fractional measures of 1/4 and 1/2. Use discs for visual clues B) Have students work pp. 105-116 Use geometric figures for art class.
VI. Addition of Whole Numbers -Computing sums with two, three, and four addends. -Reconstruction Problems -Correcting computations of pre-worked problems -Ordinal Numbers Time: approx. 1 week	A) Discuss problems orally in class. Work problems step by step. Guide the students through the thinking processes of addition. Call to the attention of the students that addition is a binary process. Use array models or chalkboard to illustrate the steps in working the problems. 23 ADD ALL ONES FIRST AND 33 PUT THE WHOLE ANSWER DOWN +12 8 ADD ALL TENS AND PUT DOWN 60 WHOLE ANSWER (may be 68 reversed) B) Provide many opportunities for board work practice sheets and oral drill on facts.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program G.C.M.P.,Worksheets pp. 105-116 *Key Topics in Mathematics for Primary Teachers*, SRA B) Money kit (either real or play) Rulers Number line Flannel board & cut-outs Geometric figures- rectangle, triangle, and square- (these may be concrete or semi-concrete) Fractional discs Books, pencils, etc. for measuring	A) Pupils are able to make comparative measures in a meaningful way and to apply this knowledge to every day situations. Students demonstrate the ability to compute sums involving money through direct and vicarious experience B) Weekly tests (teacher made) Diagnostic tests Self-evaluation Observation by teacher of pupils work
A) Greater Cleveland Math Program G.C.M.P., Worksheets pp. 117-132 *Key Topics in Mathematics for Primary Teachers*, SRA B) Flannel board Array cut-outs Chalkboard Abacus Flash cards	A) Students become strongly motivated toward learning arithmetic facts, skills and processes. Pupils are able to grasp the concept of addition as a binary process and apply this to column addition B) Direct observation of the children as they are engaged in the learning activity is the best appraisal method Weekly teacher-made test Worksheets and ditto sheets

Concepts	A) Teaching Methods B) Learning Activities
VII. Measurement -Time; Investigating intervals of time on a clock Minutes before the hour Minutes after the hour Time: approx. 4-5 days	A) Discuss hour hand and minute hand. Use actual happenings to show time Explain carefully the intervals of time such as 1/2 hour, 5 minutes etc. Demonstrate how to write time Example 12:30 or 12:05 Give students an opportunity to practice writing aswell as telling time. B) Let children make own clock and show time Do worksheets pp. 133-137
VIII. Subtraction of Whole Numbers -Two-digit subtracting without borrowing -Place value of ones, tens, and hundreds -Using pennies and dimes to emphasize ones and tens -Story problems -Recognizing differences as missing addends Time: approx. 9-10 days	A) Review concept of difference. Use chalkboard to demonstrate problems step by step Number line may be used to explain difference Example 30-20 It is the number when added to 20 will give 30. Show on flannel board sets of different colored discs-only one color show at a time. Compare sets to discover "how many more?" Use number line and chalkboard to carefully develop the subtraction algorism involving borrowing. Stress the fact that when cents is subtracted from cents the answer is always cents B) Have students go to board 3-6 at a time. Give every other student the same problem. Have other students work at their desks. Teacher should dictate problems to solve. Carefully observe the students and regroup class for meeting specific needs of students.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program G.C.M.P., Worksheets pp. 133-137 Key Topics in Mathematics for Primary Teachers, SRA B) Large clock with movable hands Small individual clocks Paper to make clock faces Paper fasteners for clock hands	A) Pupils can distinguish between the hour and the minute hand Pupils can tell time to the hour half hour, and five minute intervals B) Test by making clocks and have hands drawn in to designate time Oral tests
A) Greater Cleveland Math Program G.C.M.P., Worksheets pp. 137-156 Key Topicsin Mathematics for Primary Teachers, SRA B) Place value chart Chart with questions written on it to help students with story problems Number line Counting sticks Cards showing sets of coins Flannel board, felt numbers with cent symbols Filmstrip "Place Value and Subtraction"	A) Pupils demonstrate competence in finding differences B) Self-evaluation (children grade their own papers and correct mistakes Teacher made tests weekly Observation of work on board and evaluation of daily papers

Concepts	A) Teaching Methods B) Learning Activities
IX. Addition and Subtraction -Investigation a missing addend as a difference and differences as a missing addend (inverse relationship) -Using sums and differences in application situations Time: approx. 1 week	A) Use chalkboard to demonstrate the inverse relationship between addition and subtraction. Class discussion and working of problems on blackboard. Explain equation form 16 - 8 = 8 (equation) B) Have pupils work pp. 156-166 for practice. Use flannel board and discs to visualize computational procedure in computing sums and differences. Money kit may also be used. Have pupils take turns going to the chalkboard, flannel board or countingmen to demonstrate their understanding of computing sums and differences and the inverse relationship of addition and subtraction.

Resources
A) Printed
B) Audio Visual
C) People
D) Places

A) Greater Cleveland Math Program Guide pp. 156-164
G.C.M.P. worksheets 157-166
Key Topics in Mathematics for Primary Teachers, SRA

B) Countingmen
Flannel board
Tagboard discs colored copper and silver to simulate pennies and dimes (ones and tens)
Number line on board or floor
Cards labeled tens and ones
Money kit (either real or play money)

Evaluation
A) Expected Outcome
B) Testing Program

A) Pupils are able to use their knowledge of the inverse relation of addition to subtraction to improve their computational accuracy.

B) Teacher judgment by observation
Performance on worksheets pp. 157-166
Self evaluation
Teacher made quiz

Concepts

X. Computer Mathematics
- -Exploring the use of a computer made with two rulers
- -Using rulers to compute sums and differences

Time: approx. 5 days

A) Teaching Methods
B) Learning Activities

A) Draw two large rulers on the chalkboard to illustrate the computing device. Draw one ruler at a time. Have students place the their 12" rulers in the same position as the ones you have drawn on the board. Call attention to zero as the starting point. Carefully demonstrate and explain that by moving the lower ruler to the right represents addition Example: Slide the lower ruler one inch to the right so that the 0 on thelower ruler falls below the 1 on the top ruler. This will compute all the sums 1+2=3, etc.
When the students are ready you may show how to find 2+ 4=6 by sliding the lower ruler 2" to the right and below the 0 on the top ruler Continue in like manner by sums of 3+_; 4+-, etc.
Review the inverse relationship of addition and subtraction. Demonstrate how the pupils may use mechanical computation of differences such as 7-6=1 without changing the position of the rulers

B) Let children work in groups of 2 or 3 to measure their paper rectangles and to discover how to find the combined lengths by using a computing device. Give much practic
Workpages 167-178

Resources A) Printed
B) Audio Visual
C) People
D) Places

A) Greater Cleveland Math Program
G.C.M.P., worksheets pp. 167-178

B) Paper rectangles (3" by 4" and 5" by 6")
2 rulers 12" long (for each child)
2 yard sticks

Evaluation A) Expected Outcome
B) Testing Program

A) Students are able to use their knowledge of counting numbers to check what he discovers on the computer. (Finding the correct answers is not of major importance in this unit)
Pupils become familiar with mechanical computation
Visual demonstration of pupils ability to operate a mechanical computer

B) Teacher observation of interest skills and familiarity of principles involved in mechanical computation

Concepts

XI. Place Value-Counting Hundreds
- Counting hundreds and counting tens through 1800
- Using numerals for hundreds
- Computing sums and differences of hundreds
- Recognizing numbers as sums of hundreds, tens and ones
- Writing standard numerals for sums of hundreds, tens, and ones
- Associating numbers with distances from 0 on the number line

Time: approx. 6-7 days

A) Teaching Methods
B) Learning Activities

A) Introduce conventional names for counts of hundreds on chalkboard.
Explain to students that addition and subtraction combinations apply to hundreds as well as ones and tens.
Demonstrate on chalkboard that when hundreds are added to hundreds the sum will be hundreds
Use counting men or place value chart and cards to illustrate place value
Have children take turns going to the board to write the numbers that the teacher dictates while another student places the correct fingers on the counting men or uses the place value chart and number cards.

B) Have students work pp.179-192 for practice
Play matching game, Write a column of standard numerals on one side and to the right of this column write the expanded form
Take turns calling on children to read the standard numeral and to match that numeral with the expanded form
Play relay race with members of each team writing expanded form of numbers teacher dictates.

A) Printed B) Audio Visual Resources C) People D) Places	A) Expected Outcome Evaluation B) Testing Program
A) Greater Cleveland Math Program G.C.M.P.,Worksheets pp. 179-192	A) Pupils display the ability to c count by hundreds, write numerals and compute sums and differences
B) Counting men Number line Flannel board and felt numerals 100 sticks or counting objects Place value chart Numeral cards Bead frame and beads Filmstrip "Place Value and Subtraction"	B) Observation Teacher-made tests Worksheets pp. 179-192 Self-evaluation by student

Concepts	A) Teaching Methods B) Learning Activities
XII. Addition -Investigating sums of hundreds, tens, and ones -Computing sums of hundreds, tens, and ones -Investigating addition algorisms Time: approx. 6-7 days	A) Demonstrate on the chalkboard how to compute three-digit addends. Begin by showing the thinking process and using the long algorism; $\begin{array}{r}156\\ +387\\ \hline 13\\ 130\\ 400\\ \hline 543\end{array}$ Then shorten: $\begin{array}{r}156\\ +387\\ \hline 543\end{array}$ B) Students work pp. 193-206 After pupils have finished their work they should have their work checked by the teachers manual or answer sheet, circle incorrect answers, and then correct their mistakes It is suggested that the teacher discuss each new concept with children and go over each problem with the students carefully so that a good foundation may be laid in working addition involving regrouping or carrying.
XIII. Practice Work Linear Measurement -Measuring lengths in inches, feet or yards -Computing sums of lengths and differences of lengths Time: approx. 3-4 days	A) Explain by means of large-sized ruler on the board. Demonstrate how to measure objects by using the ruler or yardsticks B) Provide many and various opportunities for pupils to measure objects in the room such as: desks, bookcase, books, etc.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program G.C.M.P., Worksheets pp. 193-206	A) Pupils become proficient in the use of the addition algorism with three-digit addends
B) Pocket chart Hundred-cards and ten-cards Flannel board Felt discs Tagbcard set union outline	B) Teacher-made quiz to test the ability of students to compute sums of hundreds Teacher observation of pupils day-to-day improvement in his work whether it is board work, class discussion or worksheets pp. 193-206
A) Greater Cleveveland Math Program G.C.M.P., Worksheets pp. 207-214	A) Pupils develop an awareness of measurement and can apply this knowledge of measurement to computation of lengths Children improve computational skills through practice
B) 12" rulers Yard stick Chart of measure(made by teacher)	B) Visual & oral demonstrations Performance on worksheets Teacher observation

Concepts	A) Teaching Methods B) Learning Activities
XIV. Ordinals and Time -Using numbers to show order and position -Using numbers to investigate order and position of days in a year -Interpreting time shown on a clock Time: approx. 4-5 days	A) Explain ordinal numerals informally counting - 1 30 Ordinal - 1st 30th Provide various opportunities for students to use ordinal numbers and numerals to show position. Draw large grids on the board. Number the first three grids. Have students help complete the grids. Let this experience lead to the making of calendars. Discuss days of the months & year Use large clock to review concept of time B) Have pupils make clocks with movable hands to set at various times Play games with students involving time-see Manual pp. 209-210 Call attention to times to the day when special events take place so students can see application of time to everyday living Pupils work pp. 215-224,practice
XV. Fractional Number -Recognizing thirds and halves -Using inches and third-inches to measure lengths Time: approx. 3-4 days	A) Explain meaning of term "fraction" to mean a"part of" Draw circles, squares, & rectangles on the board to show equal parts of 1/3, 1/2 and their relationship to a whole. Explain carefully what the 1 means and what the 2-3 means in 1/2, 1/3 Emphasize the word "equal" when referring to 1/3 of a whole as 1 of 3 parts which are equal B) Fold paper into thirds and halves Divide sets into thirds and halves Divide groups of students into thirds and halves. Exercises from chalkboard Worksheets pp.225-230

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Teacher's Manual pp. 203-210 G.C.M.P. worksheets pp. 215-224 Key Topics in Mathematics for Primary Teachers, SRA: order and position B) Calendars Clocks with movable hands	A) Children broaden their understanding of ordinal numbers by working with calendars and clocks. B) Test by making clocks and have hands drawn in to designate time. Oral tests on time and ordinal numbers. Teacher observation of daily work.
A) Greater Cleveland Math Program Teacher's Manual pp. 211-217 G.C.M.P. worksheets pp. 225-230 B) Fraction chart Concrete objects which can be divided into equal parts	A) Students are able to recognize thirds and halves and to understand their relationship to a whole. B) Classroom work tests Practical tests Teacher observation

Concepts	A) Teaching Method B) Learning Activities
XVI. Subtraction -Investigating an algorism for three-digit subtraction -Using an algorism for three-digit subtraction -Using subtraction in application situations Time: approx. 7-8 days	A) Show by use of the chalkboards that subtraction is the inverse of addition Discuss problems orally in class Work problems step by step on the board Review briefly the procedure to use when borrowing from tens place. Lead the children to seethat three-digit subtraction is basically the same as two-digit but now they must borrow from the hundreds place. Explain the decimal point and dollar sign Encourage the students to keep their numerals in straight columns or the designated places. B) Use play or real money in money problems Give much practice in writing subtraction algorisms involving money Group to meet specific needs of students within the class. Flach cards may be used for drill of subtraction facts Use worksheets pp. 231-246 for practice
XVII. Liquid Measure -Using cups, pints, and quarts to measure liquids Time: approx. 3-4 days	A) Discuss liquid measurement Have students tell of experiences with cups, pints and quarts Bring in a pail of water. Fill the different size containers and see how much each will hold. Help children discover how many cups in a pint- pints in quart, etc. Discuss the larger quantity the cup than pint, etc. B) Permit children to become actively involved in the measuring activity

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Teacher's Manual pp. 218-229 G.C.M.P. worksheets pp. 231-246 Key Topics in Mathematics for Primary Teachers, SRA B) Money - real or play money Sale ads for problems Bundles of sticks 20 bundles of 100 20 bundles of 10 20 single sticks Number strips Countingmen Flannel board, numeral symbols, and money symbols	A) Pupils know how to place numerals in proper column for subtraction of three digits including dollars and cents. Students demonstrate the ability to compute three digit subtraction including the procedure used in borrowing from hundreds place. B) Weekly tests Self evaluation Worksheets pp. 231-246 Observation
A) Greater Cleveland Math Program Teacher's Manual pp. 230-232 Dittos made by teacher B) Containers: cups pints quarts Pail of water	A) Pupils become aware of the advantage of having standard units of liquid measure and will gain an understanding of quart, pint, and cup as standard units of measure. Children see the relationship between the pint and quart, the pint and cup, and the cup and quart. Students see the relationship of liquid measure to daily living. B) Oral tests Observation

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Concepts	A) Teaching Methods B) Learning Activities
XVIII. Addition and Subtraction -Computing sums and differences -Extending understanding of the commutative and associative properties of addition Time: approx. 5 days	A) Work sample problems at the board. Lead children to discover the commutative and associative properties of addition Guide students in a class discussion of the commutative property - "the law of order", 3+2=5; 2+3=5 Do likewise for the associative property of-"law of grouping" (3+2)+4=9 or 3+(2+4)=9 B) Provide some meaningful activities for children to gain better understanding and practice in computing sums and difference. This may be done through board work, games, ditto sheets or G.C.M.P. worksheets pp. 247-262

A) Printed
B) Audio Visual
Resources C) People
D) Places

A) Greater Cleveland Math Program
G.C.M.P., worksheets pp. 247-262

B) Countingmen
Number line

A) Expected Outcome
Evaluation B) Testing Program

A) Pupils indicate by their work and intelligent questions that they are extending their understanding of the associative & commutative properties of addition

Pupils are able to apply their knowledge of addition and subtraction to compute sums and differences ones through hundreds

B) Oral tests
Pupil observation
Achievement tests
Daily work

Concepts	A) Teaching Method B) Learning Activities
XIX. Repeated Addition -Investigating repeated addition -Counting by 2's, 3's,,4's, & 5's. Time: approx 4-5 days	A) Use the flannel board and cut-outs to illustrate how equivalent sets may be joined to find the number of objects altogether. Lead the children to discover the repeated addition pattern in relation to counting by 2's, 3's, 4's and 5's Have class discussion involving the many things in the child's environment which comes in 2's pair of mittens, socks, twins, etc. B) Use groups of children or concrete objects to divide into equal groups of 2's, 3's, 4's, and 5's. Ask questions such as: How many groups of boys? How many groups of girls? How many altogether? Provide meaningful experiences for children to visualize the repeated addition in terms of sets Example: as children line up for recess, gym class or lunch, have them walk in 2's, 3's, 4's, and 5's Call on two sets to move out of the room or line. Ask how many children are in this set (or group) Have the next three sets step forth-how many in this set. Continue in like-manner to determine total number of children in sets of 4,5 and 0 sets.

Resources
A) Printed
B) Audio Visual
C) People
D) Places

A) Greater Cleveland Math Program
G.C.M.P., worksheets pp. 263-272
Key Topics in Mathematics for Primary Teachers, SRA

B) Flannel board
Felt cutouts
Books, pencils, or other objects
Plastic numerals and symbols
Bead frame

Evaluation
A) Expected Outcome
B) Testing Program

A) Pupils are able to count by 2's, 3's, 4's and 5's
Students develop the readiness for multiplication by investigating repeated addition

B) Diagnostic tests
Oral participation
Teacher observation
Daily performance on worksheets
Self-evaluation

Concepts	A) Teaching Methods B) Learning Activities
Mathematics - Third Year Review - approx. 3 weeks	A) Oral discussion and demonstration of previous concepts taught. B) Provide practice sheets for review.
I. The Product -Arrays -Partitioning Time: approx. 4-5 days	A) Explain meaning of array, product, and partitioning. Draw arrays on the board. Demonstrate how an array can be used to find out "how many". B) Children draw arrays - Use the arrays to find out "how many".
II. Properties of Multiplication -Meaning of multiplication -As a sum -Equivalent products Time: approx. 4-5 days	A) Oral discussion and demonstration of the commutative, associative and distributive properties. (It is suggested that these be dealt with at a slow rate and at different class periods.) Guide students through an investigation of the properties of multiplication. B) Use concrete objects to separate into equal groups. Make pictures of arrays to demonstrate points. Develop chart with children to show key words and symbols which give clues to the multiplication properties. Refer to Teacher's Manual for additional activities.
III. Time -Hours -Minutes -Reading a clock -Seconds Time: approx. 2 days	A) Review concepts of 1/3, 1/2, 1/4, through oral discussion and examples on board. Show the relationship of the above concepts to time. B) Let pupils take turns in setting hands of a clock to specified times given by various pupils. Students make up problems dealing with time. Pupils make individual clocks with movable hands to set at various times.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
	B) Diagnostic testing of previously taught concepts in basic addition and subtraction.
A) Greater Cleveland Mathematics Program Unit 1 (Teacher's Manual) Latest Edition G.C.M.P. text A 1-11 B) Chalkboard or other visual aids	A) The significance of an array becomes apparent to the students. Students are able to use arrays to find products; thus understanding the meaning of multiplication. B) Oral testing Observation Skills performed on worksheets
A) Greater Cleveland Math Program Unit 2 G.C.M.P. worksheets A 11-20 Key Topics in Math for Primary Teachers, SRA B) Material for chart Magic marker Concrete objects such as: Blocks, clothespins, beads, desks, children themselves, etc. Poster paper (cut into squares) Filmstrip: Commutative Property of Multiplication, FOM	A) Students display the ability to use their concepts of the properties of multiplication to find the product. Are able to perceive the relationship of multiplication to addition. B) Pupil observation Diagnostic tests Skills demonstrated on worksheets
A) Greater Cleveland Math Program Unit 3 G.C.M.P. worksheets A 21-24 Key Topics in Math for Primary Teachers B) Individual clocks (either made or purchased One large clock Flannel board Flannel cutouts Game - Tell Time Quizmo	A) Pupils develop the ability to tell time accurately. Pupils demonstrate the ability to tell fractional measures of time such as: 15 minutes = 1/4 20 minutes = 1/3 30 minutes = 1/2 B) Teacher made test duplicated on paper. Teacher dictated tests of various times. Oral tests.

Concepts	A) Teaching Methods B) Learning Activities
IV. Numeration -Meaning of standard numeral -Place value ones tens hundreds thousands Time: approx. 6 days	A) Oral presentation, explanation, and discussion. Use of concrete and semi-concrete objects to demonstrate. Discuss distinction between number and numeral. Child demonstration. Board demonstration B) Have children use blocks to build a cube. Guide students in an investigation of blocks used to build the cube. Help them discover the multiples of tens pattern. Use countingmen to explore place value concepts. Board races - Write numerals or compute as teacher dictates. Refer to Teacher's Manual for additional help and activities.
V. Computation of Products -Repeated addition concept -Combination through 5 x 9 computation of one digit multiplication Time: approx. 8-10 days	A) Oral discussion and examples on chalk board and flannel board. Compare relationship of multiplication to addition. Oral discussion of the meaning of multiplication sentences - 5 x 2=10 (5 groups with 2 in each group). This concept needs to be taught very carefully with much oral practice on behalf of the pupils. Stress the equality in groups. Example: 5 x 2 (Each group will have two). B) Make pictures to illustrate facts. Permit pupils to manipulate various concrete objects to separate into equal groups. Have students help each other with flash cards. Give written practice. Have children play game by placing ball on a number and give the answer. Multiplication game.

M e 61.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 4 G.C.M.P. worksheets A 25-38 Key Topics in Math for Primary Teachers, SRA B) Place value charts Countingmen Bundles of sticks Various concrete objects which may be in classroom. Refer to Teacher's Manual for additional list which may be used but not available to each and every teacher. Filmstrip: Names for Numbers, FOM	A) Pupils exhibit an understanding of the ones, tens, hundreds, and thousands place in our numeration system by their ability to use the concepts in simple computation. B) Oral tests. Progress made by students as observed by teadher. Teacher made test. How well the students use their skills on the daily work sheets.
A) Greater Cleveland Math Program Unit 5 G.C.M.P. worksheets A 39-60 Key Topics in Math for Primary Teachers, SRA Ditto sheets for practice B) Pictures - charts Multo game Concrete objects such as: beads, toys, books, clothes pins Flannel board and symbol cutouts Use chalkboard Flash cards	A) Pupils demonstrate the ability to perceive the relationship between multiplication and addition. Pupils are able to compute one digit multiplication problems through 5 x 10. B) Diagnostic tests Chalkboard tests Dictation Observation Skills performed on worksheets

Concepts	A) Teaching Methods B) Learning Activities
VI. Addition and Subtraction Facts -Commutative property of addition -Place value adding and subtracting two place numerals. adding and subtracting three place numerals. adding and subtracting four and five place numerals. -Using zero as a place holder in addition and subtraction Time: approx. 8-10 days	A) Oral presentation, explanation and discussion of place value. Use pocket chart showing ones, tens, hundreds and thousands. Usage of sticks, bundles of paper strips, or countingmen will prove helpful in stressing place value. To show zero as a place holder use a chart. B) Have children take turns going to the board, chart or countingmen and illustrate place value as the teacher calls off numbers to be illustrated. When one child shows the illustration, have another child write the numeral that corresponds on the board. Give much practice.
VII. Addition and Subtraction of Whole Numbers -Addition 2-3 digit addition with carrying to tens place. computation of 2-4 digit addition with carrying to the thousands place. column addition of 3 and 4 numerals and 4 digits. -Subtraction 3-4 digit subtraction with borrowing in ones, tens, and hundreds place. computation of 2-4 digit subtraction with borrowing. -Addition and subtraction as inverse operations -Linear measurement addition of like units (such as inches added to inches). Subtraction of like units -Measurement of money monetary units to hundred dollars; using the period and dollar sign to express money. -Reconstruction problems -Story problems Time: approx. 11-12 days	A) Use chalkboard, flannel board, charts, countingmen and other visual means to illustrate place value, regrouping, and the basic algorisms for addition and subtraction. It is suggested that each of the concepts be taught at different times. Much practice should be given dealing with each new concept; thus making way for future, accurate computation. B) Seat games. Board excercises and games for class drill. Use concrete objects to show inverse relationship of addition and subtraction. Stress legibility and straight columns. Work reconstruction problems together as a group. Use problems arising in classroom, lunchroom, playground or any life situation to aid in linear measurement of money problems. M e 63

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 6 G.C.M.P. worksheets B 61-80 Key Topics in Math for Primary Teachers, SRA B) Place value charts Pocket charts Counting sticks Paper strips Countingmen Refer to Teacher's Manual Unit 6 for additional materials and teaching suggestions Filmstrip: Two Properties of Addition	A) Pupils demonstrate the ability to work with place values. Pupils are able to compute addition and subtraction of 2-5 numerals using zero as a place holder. B) Use of knowledge in classroom situations. Ability to apply skills on work pages 61-80. Direct observation of the children as they are engaged in a learning activity is the best appraisal method.
A) Greater Cleveland Math Program Unit 7 G.C.M.P. worksheets pp. 81-104 Key Topics in Math for Primary Teachers, SRA B) Place value charts Flannel board and cutouts Abacus Countingmen Toy and real money Pocket charts Ruler Yardstick Filmstrip: Place Value and Subtraction	A) Pupils demonstrate the ability to apply their knowledge of place value, regrouping and inverse relationship, to compute addition and subtraction combinations of 2-6 digits with both borrowing and carrying. Students express their understanding of the importance of keeping columns straight. Children are able to apply their knowledge of measurement to a given situation. B) Diagnostic test Teacher made test on each concept taught Observation Worksheets on pp. 81-104

Concepts	A) Teaching Methods B) Learning Activities
VIII. Computation of Basic Products -Verifying products by using repeated subtraction -Product as a sum of partial products -Computation of multiplication of whole numbers Time: approx. 8-10 days	A) Use flannel board and felt cutouts to illustrate the partitioning of sets. Review the term "partition". Present, discuss and illustrate the thinking process used in finding the product as a sum of partial products. Use chalkboard or flannel board to illustrate the concept of repeated subtraction as related to multiplication. B) Use flash cards for drill on the basic multiplication facts. Play "multo" game. Board work by class members.
IX. Geometry -Comparative sizes of rectangles in relation to the number of square units needed to cover the rectangles. -Area of a rectangle (informal introduction). Time: approx. 2-3 days	A) Review term rectangle. Use chalkboard or preferably a flannel board and felt cutouts to demonstrate comparative sizes of rectangles and squares. If possible use a large concrete block, box, or etc. and small square ones to show the number of squares needed to cover the large rectangualr box, block, etc. Guide pupils in discovering the area of a rectangle. B) Use geometric figures such as squares and rectangles in a creative way. Make a picture using different geometric figures in art class. Paper folding of squares, rectangles, and parallel lines.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 8 G.C.M.P. worksheets B 105-124 Key Topics in Math for Primary Teachers, SRA B) Flannel board and array cutouts Multo game Flash cards Concrete objects such as: Buttons, sticks, blocks, toys, etc, to help with facts Yarn	A) Pupils are able to compute unfamiliar products as the sum of partial products. Students demonstrate the ability to compute products through 10 x 9. B) Teacher made test Dictation Observation Diagnostic tests
A) Greater Cleveland Math Program Unit99 G.C.M.P. worksheets B 125-131 Key Topics in Math for Primary Teachers, SRA B) Flannel board Felt cutouts of squares and rectangles Ruled paper in squares Construction paper figures Filmstrip: Experimenting With Area, FOM	A) Students are able to determine the number of square units needed to cover a rectangular area by using comparative sizes of rectangles and squares. B) Teacher observation Pupil evaluation of his work Worksheets B 125-131

Concepts	A) Teaching Methods B) Learning Activities
X. Computation of Basic Products -Investigating properties of multiplication (informal introduction) Commutative Distributive -Partitioning arrays to compute multiples of 8 and 9 -Using arrays to compute products -Verifying products by using repeated subtraction Time: approx. 9-10 days	A) Use arrays as models to show students how to compute products. Use a step-by-step procedure and ask questions as you illustrate the procedure. B) Provide meaningful practice for the students through board work or appropriate ditto sheets. Divide the class into groups. Give additional practice for those who understand readily or have those students help pupils who need extra work. Move about classroom giving needed help to students as they work their assigned work pages. Drill work Multo game
XI. Numeration: Thousands -Writing standard numerals for sums of thousands, hundreds, tens and ones -Using commas to separate a numeral into periods -Reading and interpreting numerals for large numbers (millions, billions, or trillions); using expanded notation -Using place value in computation of sums and differences -Using numeration and basic facts to compute products of tens, hundreds, or thousands -Interpreting standard numerals in many ways Time: approx. 2 weeks	A) Review the meaning of each word or introduce new words relating to our numeration system. Example: million, thousands, etc. Do this before you begin your presentation of each lesson. Review place value by writing the names of the places on a chart or the chalkboard. Place a 1 in ones place and have the numeral identified and its meaning given. Put a 1 in the tens place and a 0 in the ones place. Repeat procedure as for ones. Extend this activity to the other four places. Challenge the students to name a number beyond 999,999 - discuss meaning and read aloud. Discuss different ways of thinking of large numerals such as millions. B) Do much oral work with students to help them read large numerals. Send small groups to the board to write large numerals.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 10 G.C.M.P. Worksheets B 133-152 Key Topics in Math for Primary Teachers, SRA B) Flannel board Felt array cutouts Flash cards Multo game	A) Students demonstrate the ability to compute multiples of 8 and 9. B) Self - evaluation Teacher made test Observation Worksheets B 133-152
A) Greater Cleveland Math Program Unit 11 G.C.M.P. worksheets C 153-172 Key Topics in Math for Primary Teachers, SRA B) Countingmen Numeral cards Place value chart Paper, pencil Filmstrip: Names for Numerals	A) Students show an understanding of our numeration system. Pupils are able to write standard numerals for sums of thousands and to use commas to separate a numeral into periods. Students demonstrate the ability to compute products of tens, hundreds, or thousands. B) Pupils grade their own work, correct mistakes and bring work on pp. 153-172 for evaluation. Weekly teacher made test.

Concepts

XII. Long Multiplication
- Finding products as the sum of partial products
- Distributive property
- One place multiplier
- Two place multipliers
- Three place multipliers

Time: approx. 3 weeks

A) Teaching Methods
B) Learning Activities

A) Discuss terms: multiplier, product, partial product, x, carrying, times, distributive property, etc.
Use flannel board or chalkboard to present examples of work. Guide the children carefully through the thinking process of the multiplication algorism.
Make much use of the expanded notation to partition the arrays.
The distributive property should be reviewed before beginning as this property should be used in explaining long multiplication.
For ease of computation, partial products may be arranged vertically.
Discuss the need for keeping partial products in straight vertical rows.

B) Pupils demonstrate the time saving value of multiplication.
Pupils work individually according to their needs.
Use board work for finding pupils' errors and helping them to make corrections.
Progress from one to three place multipliers as pupils are ready to move.
Have pupils work on worksheets pp. C 173-214. Have them work at their own rate, use the teachers' manual to check their work, make corrections, and bring to teacher for evaluation of work. Give individual help as needed.
Divide class into 2-4 teams. Put problems such as 678 x 279 on the board. Have each member of the team work a partial product - 9 x 678, 7 x 678, 2 x 678. The captains add sums to find products.

Resources
A) Printed
B) Audio Visual
C) People
D) Places

A) Greater Cleveland Math Program Unit 12
G.C.M.P. worksheets C 173-214
Key Topics in Math for Primary Teachers, SRA

B) Chalkboard
Paper
Pencils
Flannel board
Array cutouts

Evaluation
A) Expected Outcome
B) Testing Program

A) Students are able to apply their skills in computing long multiplication by making use of the distributive property, expanded notation and partitioning arrays.

B) Observation of work on board
Teacher made tests
Performance on worksheets C 173-214
Diagnostic tests to determine areas of difficulty

Concepts	A) Teaching Methods B) Learning Activities
XIII. Areas of Rectangles -Finding the area of a rectangle as length times width -Problem solving What happens to a rectangle when one side is doubled. What happens to a rectangle when two sides are doubled. -Investigating shapes to determine which to use for covering Time: approx. 2 weeks	A) Review terms of rectangles and square units. Draw examples on board. Explain how to find an area of a rectangle by multiplying length times width. This should be done after much practice with covering rectangles with squares. Use board work for practice, make scale drawings, and use graph paper examples. B) Use floor or ceiling tile for visual aids. Have students do paper folding to aid in the concepts of squares, rectangles, parallel lines and parallelograms.
XIV. Fractional Numbers -Linear measurement Using fractional numbers to compare lengths. Picture problems involving fractional numbers. -Money Using fractional numbers to compare value of coins. Story problems involving fractional numbers. Time: approx. 1 week	A) Discuss meaning of fractional numbers Explain what the top number means and what the bottom number means. Example: $\frac{1}{4}$. The "one" means we're talking about one part of something that has been divided or separated into four parts. The "four" means something that has been divided into four equal parts (or use four groups). B) Have students practice writing fractional numbers on the board. Students make fractional parts of a whole with construction paper. Use concrete objects in a set to show the idea of a fractional part of a group. Provide opportunities for children to measure things and write the corresponding fractional number. Measure such things as books, desks, pencils, etc. Practice drawing different geometric figures as teacher dictates length to be drawn. Orally discuss and work out meaningful story problems involving fractional parts of money.

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Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 13 G.C.M.P. worksheets C 215-228 Key Topics in Math for Primary Teachers, SRA B) Graph paper Rulers Paper to fold Flannel board Felt cutouts of large squares, small squares, large and small rectangles Floor and ceiling tile Filmstrips: Experimenting With Area Lines and Parts of Lines	A) Pupils acquire a working knowledge of and skill in finding areas of rectangles. Students realize that areas can be the same in squares and rectangles with different measurements. B) Teacher observation of pupil progress Achievement on work pages C 215-228 Teacher judgment
A) Greater Cleveland Math Program Unit 14 G.C.M.P. worksheets C 229-244 Key Topics in Math for Primary Teachers, SRA B) Rulers Yardsticks Tape measure Money kit (pennies, nickels, dimes, quarters, half dollars) Number line Construction paper Fraction kit Pencils Books	A) Students are able to read and write simple fractions. Pupils develop the ability to apply their knowledge of fractional numbers to everyday situations. B) Oral tests Teacher made quizzes Daily work

Concepts	A) Teaching Methods B) Learning Activities
XV. Missing Factor Multiplication -Problem solving Missing factor problems. Completing multiplication puzzles. Story problems (involves informal division). -Using arrays to compute products. -Commutative property Rearranging factors does not change the product. Time: approx. $1\frac{1}{2}$-2 weeks	A) Demonstrate how to use arrays as models to solve missing factor problems. Class discussion. Have students take turns working examples at the board. Show relationship between partitioning or dividing and finding the missing factor. For example: $? \times 6 = 30$ or $30 \div 6 = 5$. Use visual means to point this out. B) Have "better" students become "teachers" to help students who need lots of individual help. Have students make up story problems and other students work the problems.
XVI. Multiplication Shortcuts -Combining partial products to shorten the multiplication algorism. -Computation drill of multiplication combinations using two digits with two multipliers -Computing products without using partial products -Computing sums Time: approx. 2 weeks	A) Put examples of problems on the board. Demonstrate how to combine partial products to make the algorism shorter. Ask questions such as listed on p. D 271 and 279 to help with understanding of process. Develop chart with children to show the process used. Example: $\begin{array}{rl} 36 & \\ \underline{\times\ 42} & \text{multiply} \\ \underline{12} & \text{(ones x ones)} \\ \underline{300} & \text{(tens x ones +} \\ & \text{ones x tens)} \\ \underline{1200} & \text{(tens x tens)} \\ 1512 & \end{array}$ B) Provide many opportunities for students to do practice work, preferably board work until the process is better understood. Use flash cards for games to strengthen understanding of basic facts. Games such as Multo for learning multiplication facts.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 15 G.C.M.P. worksheets D 245-270 *Key Topics in Math for Primary Teachers*, SRA B) Flannel board Felt cutouts Numeral cards Array cutouts	A) Pupils are able to apply arithmetic knowledge to real problem solving situations. B) Teacher made quiz Teacher observation How well students apply their skills to the everyday practice worksheets
A) Greater Cleveland Math Program Unit 16 G.C.M.P. worksheets D 271-294 *Key Topics in Math for Primary Teachers*, SRA B) Array Cutouts Flannel board Chalkboard Material to make chart Magic marker Flash cards for games	A) Pupils exhibit the ability to compute products of ones, tens, hundreds and thousands by combining partial products and without using partial products. B) Teacher judgment Teacher observation Worksheets D 271-294 Weekly quiz

Concepts	A) Teaching Methods B) Learning Activities
XVII. Measurement -Liquid measurement An investigation of the quantities used to describe liquid volume. Greater than - less than comparisons. Computing amounts of liquid. -Problem solving Story problems involving liquid quantities. -Addition, subtraction, and multiplication combinations involving liquid measure Time; approx. 1 week	A) Demonstrate the use of the measures: pint, quarts, and gallons in class. Stress their comparative quantities. Put examples of problems on the board. Work examples and discuss their usage in practical ways. B) Develop a chart with students, stating the comparative quantities. Example: 2 cups = 1 pint 2 pints = 1 quart Visit dairy farm, factory, filling station, etc. to see measures in use. Have students make up problems dealing with liquid measures. Then work each other's problems.
XVIII. Applications -Problem solving Story problems involving products. Story exercises: sums and differences. Computing costs. Computing amounts of liquid. Time: approx. 4-5 days	A) Read each problem with the class. Guide the students in the thinking process. Ask questions such as: 1. What does the story tell? 2. What does the problem ask? 3. What operation should I use? 4. What numerals are involved? 5. How do I solve the problem? Work examples. Then ask: 1. Is the answer reasonable? 2. Check work. B) Make chart listing the questions above. Encourage students to think carefully about each phase of the of the problem. Set up play store with empty cartons, boxes, cans, etc. Price the items with tagboard price tags. Use clock to review time.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 17 G.C.M.P. worksheets D 295-306 *Key Topics in Math for Primary Teachers*, SRA B) Pint, quart, and gallon containers to be used for measuring liquids Material to make chart	A) Pupils acquire a working knowledge of and skill in the use of liquid measure. B) Test accuracy in measuring of pints, quarts and gallons. Ability to apply their knowledge of liquid measure in practical situations. Written tests. Teacher observation.
A) Greater Cleveland Math Program Unit 18 G.C.M.P. worksheets C 307-316 *Key topics in Math for Primary Teachers*, SRA B) Materials for chart Magic marker Chalkboard Clock Materials for "play store" Price tags made from tagboard Filmstrip: Solving Problems-Which Operation?	A) Students are able to apply previous taught concepts to help them solve story problems. B) Diagnostic tests to find area of difficulty (Plan to give additional work in area needed). Worksheets D 307-316. Teacher obervation. Self evaluation.

Concepts	A) Teaching Methods B) Learning Activities
XIX. Computation -Increasing computational skills	A) Brief review of the basic operations of addition, subtraction, and multiplication. Assign a limited number of pages to be worked after each lesson for those students who need day-to-day instructions. Then reteach and assign other pages. Give individual help as needed. For students who are capable of working well on their own, assign the whole unit. Have students check their work by Teacher's Manual, correct their mistakes and come to teacher for additional help if student missed more than 2 or 3 problems per page or as need arises. B) Assign "teacher helpers" for slower students. Encourage children to work on their own, proof-read their work and try to improve their computational skills.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Greater Cleveland Math Program Unit 19 *Key Topics in Math for Primary Teachers*, SRA G.C.M.P. worksheets D 317-337	A) Pupils demonstrate the ability to compute problems of addition, subtraction, and multiplication with a certain degree of accuracy and understanding including measurement of money and linear measurement. Students are able to think through a problem rather quickly without using detailed step-by-step procedure. B) Teacher made test Worksheets D 317-337 Diagnostic test for the year's work

Concepts	A) Teaching Methods B) Learning Activities
Mathematics - Fourth Year I. Sets and Problem Solving	A) Help the students to read a thought problem and be able to translate the problem into a mathematical sentence. B) Have the students discuss problems and try to write them out on paper.
II. Numeration	A) This chapter deals with the interpretation of place value. B) Have students read and discuss material. Solve exercises with teacher assistance.
III. Rounding Numbers	A) Rounding of numbers is a basic technique in making approximations. When estimating the answer for an exercise, it would be helpful to know the minimum and maximum of the range in which the answer will be found. B) Have students round numbers before they compute the results of a problem.
IV. Arrays and Problem Solving	A)Help students read and be able to write mathematical sentences from written sentences. B) Students should solve mathematical sentences on paper having mastered previously basic multiplication and division combinations.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 1-10 vol. 3	A) All pupils should exhibit an ability to write addition and subtraction equations to express the relationship among three numbers. B) Administer suggested quiz at the end of this unit or substitute a teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 11-29 vol. 3	A) Students may interpret a numeral in many ways. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 30-38 vol. 3	A) Students should be able to exhibit an ability to round a whole number to the nearest ten by choosing the multiple of ten that is closest in value to the number we are rounding. B) Administer suggested quiz at the end of the unit or substitute a teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 39-48 vol. 1	A) Students should be able to demonstrate the meaning of multiplication and division by being able to state the number structure of a story in equation form and then to use. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
V. Multiplication of Whole Numbers	A) Develop a readiness for the multiplication algorism by using arrays. B) Have students solve multiplication exercises on board and on paper with teacher assistance.
VI. Open Sentences	A) Explain to the students the difference between open and closed sentences. Help them to create true sentences from open sentences. B) Unit can be done independently after discussion on material has been presented.
VII. Exploring Geometry	A) Discuss with the students the concept of a point. After some exploration of the idea of a point and locations of points, we begin an investigation of two points. In considering two points, we see that there is a distance between them called a line segment. B) Have students read and discuss the unit.
VIII. Measurement	A) Suggest that objects being measured are compared with a standard unit. B) Have the students investigate the different methods of measuring. Use a balance scale in showing the measure of weight.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 49-70 vol. 1	A) Illustrate an ability to find the product of two whole numbers by employing the basic multiplication facts. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 71-90 vol. 1	A) Students should display a skill in recognizing a mathematical sentence to be true, false, or open. Also students should be able to construct true sentences from open sentences. B) Administer suggested quiz at the end of this unit or substitute teacher-made device.
A) G.C.M.P. Intermediate Units pp. 91-105 vol. 1	A) Students should display a clear notion of a point and should have perceived some of the many relations between points. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 106-117 vol. 1 B) Balance scales Containers (cups, pints, gallons)	A) Students should explore liquid measurement and weight by emphasizing the value of standards of measuremsnt. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
IX. Multiplication of Whole Numbers	A) Review the multiplication algorism and demonstrate multiplication of three and four place numbers. Make students aware of the importance of place value. B) Solve multiplication problems on chalkboard and on paper.
X. Missing Factor Problems	A) Any two whole numbers have a product. In this unit the inverse problem is investigated. Given a product and a factor, find the other factor. B) Have students solve problems in this unit on paper with teacher assistance.
XI. Division Algorism	A) Develop the division algorism for the students. Use the equation $b = aq + r$ to begin the idea of finding a quotient (q) and a remainder (r). B) Have the students perform exercises on the chalkboard.
XII. Geometry: Lines	A) Explore the properties of lines. Help the students discover the meaning of skew, parallel, and intersecting lines. B) Have students use string to demonstrate kinds of lines.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 118-139 vol. 1	A) This unit is designed to strengthen the students' ability to compute products. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 140-156 vol. 1	A) This unit provides students with the opportunity to construct and solve multiplication equations with missing factors. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 157-168 vol. 3	A) Students should exhibit the use of the diviiion algorism. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 169-175 vol. 3 B) String	A) Students demonstrate a knowledge of lines. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XIII. Money	A) Review the value of different United States coins. Show how each amount less than a dollar can be written two ways. Solve problems using the four fundamentals and money. B) Have students solve problems individually on paper and on chalkboard.
XIV. Introduction to Fractional Numbers	A) Help students get a broader understanding of fractions by use of a number line and regions. B) Solve problems in addition and subtraction with fractional numbers.
XV. More Division of Whole Numbers	A) In this unit, continued exploration of the division algorism is done. Pupils investigate patterns in division equations to find what happens to the quotient when one variable remains the same and the other is increased or decreased. Emphasis in this unit is on accurate computation in using the division algorism. B) Have students solve problems individually on chalkboard and paper.
XVI. Dozenal System	A) The decimal system of numeration is a place value system based on tens. The dozenal system of numeration is a place value system based on twelves. Added computational skill in division by 12 is accomplished in this unit. B) Have students solve problems in this unit on board and paper with teacher assistance.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 176-185 vol. 3 B) U.S. coins	A) Students relate the names of U. S. coins and bills to the quantities of money they represent. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 186-211 vol. 3	A) Students demonstrate a basic ability to add and subtract fractional numbers having common denominators. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 213-227 vol. 3	A) Students display a more refined use of the division algorism. B) Give suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 228-234 vol. 3	A) Students illustrate a knowledge of computation in the context of the dozenal system. B) Give suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XVII. Linear Measurement	A) Standards of measurement of length are discussed in this unit. Problems of conversion from one unit to another using both fractional numbers and whole numbers are presented. This unit provides a good review in addition of fractions and mixed numbers. B) Have the students solve exercises on the chalkboard and on paper.
XVIII. Bar Graph and Histograms	A) The difficulty in understanding a large number of measurements is primarily on of organizing them so that the reader can quickly see the whole set of measurements. To help describe the distribution, two statistical concepts are introduced - the mean and the range. B) Have students draw histograms on paper with teacher assistance.
XIX. Whole Number Computation	A) Increased skill in the computation of whole numbers is the object of this unit. B) Help students improve in this area by practice on the board with teacher guidance.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 235-264 vol. 4	A) Students establish a standard for comparison called a unit of measure. B) Give suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 265-273 vol. 4	A) Students display an ability to show a distribution by bar graphs and histograms. B) Give suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 274-298 vol. 4	A) Students exhibit a skill in computation in whole numbers of sums, differences, products, and quotients. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XX. Exploring Geometry	A) This chapter is the third of a trilogy in which students first investigate points, then lines, and now planes. Emphasis should be on the pupils' discovery of the relationships between two planes and among three or more plane. They should develop an ability to perceive planes suggested by physical objects in his environment and to perceive planes that do not have physical models but are only suggested by three physical points. B) Have students use cardboard to help develop a feeling for the plane, but point out that cardboard is only a model for a segment of a plane.
XXI. Primes and Composites	A) Understanding of multiplication will be deepened considerably by an investigation of prime and composite numbers. B) Students solve unit with teacher guidance.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 299-306 vol. 4 B) Cardboard	A) Students through investigation find a relation of lines and planes in space. B) Give suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 307-312 vol. 4	A) Students disclose a knowledge of prime and composite numbers. B) Give suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
Mathemathics-Fifth Year I. Set of Quotients	A) Number lines and regions are used to show fractional numbers as quotients. Show these demonstrations on the chalk board. B) Have students draw regions & number lines to show fractional numbers as quotients
II. Open Sentences	A) Demonstrate to the students how to use the number line to determine the results of an equation Example: $3X=12$ 3X and 12 will both appear at the same location on the number line. From this right end point decrease 3X to 0X which will be the left end point. Divide the value 12 into the number of partitions the line segment was divided into 12/3 24/3 0____.____.____12 0X 1X 2X 3X By observation, X= 12/3 of 4 B) Have students work in small groups with teacher to help in solving problems.
III. Introduction to Fractional Numbers	A) We consider the whole-number quotient first, then fractional number quotients. This chapter develops set comparison as a basis for understanding the meaning and use of fractions. B) Have students work independently or in small groups with teacher guidence.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 1-13 vol. 5	A) Students present quotient as fractional mumbers B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 14-25 vol. 5	A) Students will continue the development with open sentences that define open sentences B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 26-35 vol. 5	A) Students develop set comparison as a basis for understanding the meaning and use of fractions B) Administer suggested quiz at the end of this unit of substitute teacher-made testing device

Concepts	A) Teaching Methods B) Learning Activities
IV. The Properties of the Set of Fractional Numbers	A) Show in this chapter that the properties of the set of whole numbers apply to the set of fractional numbers. The set of fractional numbers has one property that the set of whole numbers does not-the inverse property for multiplication. For each fractional number a/b (except 0) there exists a fractional number b/a such that a/b x b/a=1 B) Have thestudents use this inverse property or reciprocal idea to solve problems in this unit
V. Multiplication of Fractional Numbers	A) Show the principle of multiplication of fractions by shaded regions. Draw these regions on the chalk board to illustrate this idea. Develop from this the process of finding the product by multiplying the numerators and the demominators together to obtain the final numerator and denominator. B) Have the students draw regions to find products.
VI. Division of Fractional Numbers	A) Show division of fractions by creating a complex fraction from the given division problems Clear the fraction by multiplying the numerator and denominator both by the reciprocal of the denominator. Thus, the problem becomes a multiplication problem. B) Have students try to work through the logic behind the solution of division of fractions in problems

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 36-48 vol. 5	A) Students display the knowledge that the properties of whole numbers apply also to fractional numbers B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 49-76 vol. 5	A) Students display an ability to compute products in the set of fractional numbers B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 77-92 vol. 6	A) Students display an ability to compute quotients in the set of fractional numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device

Concepts	A) Teaching Methods B) Learning Activities
VII. The Box	A) In this unit we explore the twenty-eight lines determined by the verticies. Any two lines can be seen to be parallel, intersecting or skew B) Have students construct a rectangular prism for their use in solving the ideas of this unit
VIII. Fractional Numbers Addition & Subtraction	A) Students have already acquired some familiarity with the addition and subtraction of fractional numbers whose fractions have common denominators. In this unit we will investigate the problem of adding fractional numbers whose fractions have different denominators. B) Have students do computations on the chalk board and at their desks.
IX. Geometric Figures	A) Help the student to be able to determine the amount of face, edges and vertices of the figures in this unit. B) Have student work in small group or individually with teacher guidance.
X. Measurement: Area	A) Show the students the importance of a standard unit of measure for determining area. Develop formulas for finding the area of a rectangle. Use this idea in computing the area of composite areas. B) Have students in small groups determine the area of a composite figure.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A)G.C.M.P. Intermediate Units pp. 93-104 vol. 6	A) Students investigate points, lines, and planes in a rectangular prism B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 105-139 vol. 6	A) Students should acquire a skill in computation of the sums and differences of fractional numbers B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 140-150 vol. 6 B) Model of Triangular pyramid Truncated pyramid Octahedrom Tetrahedron Cube	A) Students should investigate two and three dimensional geometric figures and be able to identify faces, edges, and vertices of these figures. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 151-170 vol. 6	A) Students compute the area of some two dimensional figures B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device

Concepts	A) Teaching Methods B) Learning Activities
XI. Trial and Success	A) Trial begins with a guess at the solution of an exercise. The trial tells us whether the guess was too large or too small. This information then helps us in making a better guess. Continued trials lead to a guess that is the solution to the exercise. This is success.
XII. Exact Division	A) In the set of whole numbers, exact division is possible if the division can be multiplied by some whole number to obtain the dividend. Practice is given in this unit to long division of whole numbers. B) Have students work individually with teacher help. Board work may prove profitable for the class.
XIII. Introduction to the set of Integers	A) In the set of whole numbers, addition is always possible but subtraction sometimes cannot be completed. Thus, a new set of numbers is created; negative and positive whole numbers are called integers. B) Have students solve problems in this unit with teacher help.
XIV. Computation in the Set of Integers: Addition and Subtraction	A) After the students have gotten a basic ability to compute addition and subtraction problems using the set of integers, continue solving addition and subtraction in this unit. B) Have students compute results to addition and subtraction problems using the set of integers

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 171-181 vol. 6	A) Students compute results to story problems by use of trial and success method. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 182-200 vol. 7	A) Students compute exact quotients to division problems B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 201-219 vol. 7	A) Students, by using the idea of the number line are able to exhibit a knowledge of what integers are B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 220-245 vol. 7	A) Students compute the results to addition and subtraction of the set of integers. B) Administer suggested quiz at the end of this unit or substitute teacher made testing device

Concepts	A) Teaching Methods B) Learning Activities
XV. Geometry: Angles	A) Discuss the formation of an angle as the intersection of two rays Suggest ways of naming angles B) Have students read and solve unit independently with teacher help
XVI. More about Integers	A) Extend the knowledge of integers by applying physical models to them in order to make addition and subtraction more concrete B) Students solve unit independently with teacher help.
XVII. Measuring Angles	A) Demonstrate how to use a protractor to find the measure of an angle. B) Have students use protractors to find the measure of angles
XVIII. Round Numbers	A) The number line is a convenient device to explain approximations. In checking the results of the exercise, it may be helpful to know a greatest possible result and a least possible result. B) Have the students round off numbers and approximate results, then calculate answer. Check one with another.
XIX. Scale Drawing	A) A scale drawing of an object is a drawing in which each length shown corresponds to a length of the object. A scale drawing may be larger than the object, smaller than the object, or the same size as the object. B) Student should practice drawing figures to scale

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 246-256 vol. 7	A) Students investigate the formation of an angle and the various kinds B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 257-270 vol. 7	A) Students increase their ability to compute with integers B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 271-287 vol. 8 B) Protractor Straightedge	A) Students compute the measure of an angle B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 288-302 vol. 8	A) Students exhibit the ability to approximate numbers may be used to determine approximate results to mathematical exercises B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 303-315 vol. 8	A) Student illustratesa drawing to scale B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device

Concepts	A) Teaching Methods B) Learning Activities
XX. Number structure of story Exercises	A) Show children a relationship of word sentences & number sentences Help them to interpret words into number ideas B) The children work individually and in small groups.
XXI. Introduction to Decimals	A) Expose the students to the idea that fractions can be expressed as decimals. Help them discover place value as related to decimals B) Have the students solve individually or with teacher help problems in this unit
XXII. Computation	A) This unit is a review of the fundamentals dealing with whole numbers, fractions, and integers B) Have students solve this section individually

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 316-332 vol. 8	A) Students exhibit the ability to express story exercises as equations or inequalities B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 333-346 vol. 8	A) Students demonstrate a knowledge of the basic meaning of decimals B) Administer suggested quiz at the end ot this unit or substitute teacher-made testing device
A) G.C.M.P. Intermediate Units pp. 347-364 vol. 8	A) Students solve whole number and fractional number problems. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device

READING COMMUNITY SCHOOLS

CURRICULUM GUIDE

MATHEMATICS

MIDDLE

Concepts	A) Teaching Methods B) Learning Activities
Mathematics - Sixth Year I. Decimal Numeration	A) Explain to the students by demonstration and discussion the idea of place value. B) Have individual pupils working at the chalkboard. Use the multiplication form (for example: 400 = 4 hundreds = 40 tens = 400 ones). Have students, in as many ways as possible, interpret a decimal as a whole number of decimal parts. For example: 12.00 may be interpreted as 1200 hundredths, 120 tenths, and 12 ones.
II. Addition and Subtraction With Decimals	A) Discuss with students the importance of place value in the addition and subtraction of decimals. B) Have students work together and individually in solving problems.
III. Multiplication With Decimals	A) Discuss with students that to compute the product of two numbers, .7 and .6, first compute the product of the whole numbers, 7 and 6, and then the product of the decimal parts (tenths x tenths). B) Have students solve problems of multiplication on chalkboard and on paper. Have students work individually and in small groups.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 1-16 vol. 9	A) Students display a basic knowledge of decimal numeration. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 17-26 vol. 9	A) Students show ability to compute results to addition and subtraction problems with decimals. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 27-40 vol. 9	A) Students compute results to problems of multiplication with decimals. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
IV. Division With Decimals	A) Discuss in a similar way as with multiplication of decimals. For example: .65 ÷ .5, first compute the quotient of the whole numbers 65 ÷ 5 and then hundredths ÷ tenths. The quotient of hundredths and tenths may be explained many ways. Explanation by fractions is one way: 1/100 ÷ 1/10 = 1/10. B) Have students work at the chalkboard to check on their progress.
V. Decimals and Fractions	A) Show the relationship of decimals and fractions by demonstration on chalkboard. B) Practice in computing in both fractions and decimals should be done on board and individually on paper.
VI. Measurement of Volume	A) Explain and demonstrate to the students,using models,the reasoning behind finding volume. B) Have students make models of the different prisms studied.
VII. Geometric Construction	A) Present this unit by use of a learning packet. B) Students work independently and at their own rate.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 41-70 vol. 9	A) Students compute results to problems of division with decimals. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 71-78 vol. 9	A) Students are able to compare fractions and decimals as to size. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 79-105 vol. 10 B) Cardboard models of: rectangular prisms triangular prisms hexagonal prisms Wooden inch cube blocks	A) Students investigate volumes and surface areas of three-dimensional figures. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 106-119 vol. 10 Learning packet on construction	A) Students display a knowledge of basic geometric oonstruction. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
VIII. Metric Measurement	A) Introduce students to the basic idea that the metric measure is set up on a basis of 10. B) Have students measure objects with their metric rulers.
IX. Repeating Decimals	A) This unit gives added computational skills in division of decimals. Most quotients do not compute to be even; therefore, the idea of annexing zeros to the dividend is used to produce an even quotient or to see that the quotient becomes repeating. B) Have student work independently or in small groups computing quotients.
X. Histograms	A) Demonstrate on chalkboard how to construct a histogram. B) Have students construct on paper problems in this chapter on histograms.
XI. Integers: Addition and Subtraction	A) Review with students the ideas of adding and subtracting of integers as presented in Book 7, Unit 12. B) Have students solve this unit at the chalkboard and at their desks.

A) Printed B) Audio Visual Resources C) People D) Places	A) Expected Outcome Evaluation B) Testing Program
A) G.C.M.P. Intermediate Units pp. 120-130 vol. 10 B) Metric rulers Meter stick	A) Students investigate the basic unit of the metric system. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 131-146 vol. 10	A) Students are able to compute quotients in decimal form by whole number computation and decimal part computation. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 147-156 vol. 10	A) Students present information about a group as a whole using a bar graph or histogram. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 157-166 vol. 11 G.C.M.P. Intermediate Units pp. 190-213 vol. 7	A) Students display an increased knowledge of the use of integers in addition and subtraction. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XII. Integers: Multiplication and Division	A) The students already understand multiplication and division of whole numbers. Therefore the sign of the product or quotient will be the new concept to be taught here. This concept can be shown by the use of the number line. B) Students can do most of their work individually with teacher guidance.
XIII. Reciprocals of the Integers	A) Explain to the students that the reciprocal of an integer "a" is the missing factor "x" in the equation ax = 1. Show students how to use the idea of reciprocals in solving equations for the unknown such as 4x = 12. B) Have students solve problems in small groups with teacher help.
XIV. Review of Fractional Numbers	A) Continue use of reciprocals in solving problems with unknowns equal to fractional numbers. B) Have students solve problems on paper individually and in small groups with teacher help.
XV. Fractional Numbers: Addition	A) Show students how to compute a least common multiple or denominator by the prime factor method. Solve addition problems of fractional numbers by finding a least common denominator. B) Students can solve this unit individually on paper.

A) Printed B) Audio Visual Resources C) People D) Places	A) Expected Outcome Evaluation B) Testing Program
A) G.C.M.P. Intermediate Units pp. 167-176 vol. 11	A) Students display an ability to compute problems of integers in multiplication and division. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 177-183 vol. 11	A) Students solve for the missing factor of problems in the set of rational numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made device.
A) G.C.M.P. Intermediate Units pp. 184-197 vol. 11	A) Students develop skills in computation of fractional numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 198-206 vol. 11	A) Students exhibit an ability to compute in addition and subtraction of fractional numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XVI. Rational Numbers as Differences	A) This unit uses the fact that rational numbers can be the remainder of two fractional numbers. B) Have students solve problems on paper with teacher guidance.
XVII. Rational Numbers: Computation	A) This unit gives extra practice in the computation of the four fundamentals using integers, solution of equations, and completion of number sentences. B) Have students compute problems on chalkboard and paper with teacher help.
XVIII. Geometry: Spheres and Circles	A) Explore the ideas of radius, circumference, diameter, great circle, and area with the students. Use figures to show great circle. Use drawings to illustrate other ideas. B) Have the students solve the problems in this unit on paper or on the chalk board.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 207-213 vol. 11	A) Students demonstrate that all rational numbers can be expressed as a difference of two fractional numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 214-234 vol. 11	A) Students exhibit an ability to compute in the set of rational numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 235-247 vol. 12 B) Spheres Compass Straightedge	A) Students exhibit an understanding of spheres, circles, and their parts and relations. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XIX. Latitude and Longitude	A) Use this unit for enrichment as time allows. B) Have students work independently on this material.
XX. More About Primes	A) Re-examine the ideas of prime numbers. Solve a couple of examples on the chalkboard. B) Have the students solve problems on the chalkboard and on paper.
XXI. Introduction to Percentage - Part I	A) Practice changing fractions from hundredths to lowest terms and vice versa. Use ideas learned in Unit 13 about reciprocals in computing results to equations. B) Have students solve problems on paper and chalk board.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 248-255 vol. 12 B) Globe	A) Student display a knowledge of the system of latitude and longitude used to locate any point on the earth's surface. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 256-262 vol. 12	A) Students reveal the definitions of primes and composites by reviewing primes and composites. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 263-270 vol. 12	A) Students display the underlying concepts of percentage without using the language of percentage. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XXII. Introduction to Percentage - Part II	A) Set up basic way of solving equations that are in the form of r% of B = P. One good method of solving for r and B is by the use of reciprocals. Solutions for P can be done by straight multiplication. B) Have students read a problem and be able to determine which numbers can be substituted for r, B, and P.
XXIII. Uses of Percent	A) In this unit the students set up equations in order to solve them for mark up, cost, mark up percent, selling price, and selling price percent. Check over basic equations with students. Help them to see how to substitute values. B) Have students work in small groups with teacher help.
XXIV. Properties of the Rational Numbers	A) This unit deals with the comparison of rational numbers as to size. Explain to students that a common name for fractions and decimals should be arrived at first in order to make the comparison. B) Have students visualize fractions and decimals on a number line in order to compare them.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) G.C.M.P. Intermediate Units pp. 271-231 vol. 12	A) Students exhibit the language of percentage in solving fundamental problems. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 282-294 vol. 12	A) Students compute problems concerned with percent. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) G.C.M.P. Intermediate Units pp. 295-312 vol. 12	A) Students explore the order properties of the set of rational numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts

Mathematics-Seventh and Eighth years

I. Counting to Computation

1. Telling how many
2. You and research
3. The invention of number symbols
4. The number and the numeral
5. Egyptian numeral system
   Supplemental material
   Evaluation material
6. Babylonian numeral system
7. Roman numeral system
   Supplemental material
   Evaluation material
8. The Hindu-Arabic numeral system
9. Fractional and Decimal notation
10. Powers and exponents
    Evaluation material
11. Other numeral systems
    Supplemental material
12. Translating into base ten
13. Translating from base ten to other bases
    Evaluation material
14. Addition in other bases
15. Subtraction in other bases
    Evaluation material
    Supplemental material
16. Multiplication in other bases
17. Base two system of numerals
18. Base twelve system of numerals
    Evaluation material
    Supplemental material
    Projects for part 1

A) Teaching Methods
B) Learning Activities

A) Units 1-11

Conduct oral discussions dealing with the development of our numeration system from caveman to present.

Units 12-18

Explain and demonstrate numeration systems that are based on a system other than ten.

B) Have students build for project an abacus that can be converted from one base to another.

Have students give demonstrations of the problem solving techniques involved in the basic operation.

Have students individually and in groups set up problems and solve them.

A) Printed
B) Audio Visual
Resources C) People
D) Places

A) Advancing in Mathematics pp. 3-46

B) Abacus

A) Expected Outcome
Evaluation B) Testing Program

A) Students should develop an appreciation of how our numeration system was developed

Students should be able to compute in bases other than base 10 the operation of addition, subtraction , and multiplication.

B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
II. Exploring Sets and Operations 1. Sets of numbers 2. Universal sets Evaluation material 3. Well-specified sets 4. Operations on sets Evaluation material 5. Closed operations 6. Time out to talk about equality Evaluation material 7. The Commutative property 8. A multiplication pattern 9. Sets of factors Evaluation material 10. Multiplying three or more numbers 11. Different operations 12. Even and odd numbers Supplemental material 13. Prime factorization Evaluation material 14. Common factors 15. Multiplication material Evaluation material Supplemental material Supplementary problems for Parts 1 and 2	A) Units 1-5 By discussion and demonstration show how each of the new symbols are used with the involvement of sets. Use practical examples to demonstrate union and intersection with sets. B) Students should solve problems in text and be able to share reasons for decisions
III. Mathematical Systems 1. Round and Round-A new relation 2. A miniature mathematical system 3. Circular addition Evaluation material 4. The identity element 5. Circular multiplication Evaluation material 6. Inverse elements 7. Circular subtraction and division Evaluation material 8. The need for new elements Evaluation material Supplemental material	A) Explain and demonstrate by board work the ideas expressed in modular arithmetic B) Have students on paper make a copy of the face of a clock. Use a paper arrow fastened to the face of the clock with a round-headed pin to represent the hour hand.

A) Printed B) Audio Visual Resources C) People D) Places	A) Expected Outcome Evaluation B) Testing Program
A) Advancing in Mathematics pp. 49-90 vol. 1 teachers' manual	A) Students should be able to display a good working knowledge of basic sets. Students should exhibit a deeper knowledge of multiplication. B) Administer suggested quiz at the end of this unit or substitute teacher-made device.
A) Advancing in Mathematics pp. 93-122 Ditto illustration of a clock	A) Students develop by contrast a more meaningful understanding of properties of numbers. Students broaden the concept of a mathematical system and its ingredients-a set of elements, at least one relation, and at least one operation. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
IV. Extension of our Numeral System 1. The struggle to invent new numbers 2. Figuring how much Evaluation material 3. Comparing fractional numbers 4. Addition of fractional numbers Evaluation material 5. Subtraction of fractional numbers Evaluation material 6. Division of fractional numbers Evaluation material 7. Multiplication of fractional numbers 8. Another look at division 9. Fractional numbers in decimal parts 10. More about decimals Evaluation material 11. Percent 12. Matching numbers with points	A) Discuss and explain the processes involved in solution of the four fundamental processes with fractional numbers. Review material on decimals B) Have students work in groups and independently in the computation of fractional numbers.
V. Places and Shapes 1. Elements of geometry 2. Geometric lines 1 Evaluation material 3. Geometric surfaces 4. Geodesics Evaluation material 5. Intersection and Union of sets and points Evaluation material 6. Angles 7. Triangles 8. Curves	A) Introduce students to the notion that the elements of geometry are ideas and that geometric ideas can be represented by physical interpretation. B) Most of this unit will be done individually by reading independently.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Advancing in Mathematics pp. 125-179	A) Students develop a deeper awareness of fractions. Students extend their skill with working with fractions by added computation in the four fundamentals. Students develop a better understanding of the relationship between fractions and decimals. B) Administer suggested quiz at the end of this unit or substitiue teacher-made device.
A) Advancing in Mathematics pp. 183-214	A) Students should develop the concept that space is the set of all points. Students should be able to exhibit a basic knowledge of lines, points and angles. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
VI. Mathematical Sentences 1. Language called mathematics 2. Constants and unknowns in mathematical sentences Evaluation material 3. Poodle problem in Pomerania 4. Inequalities and graphing 5. Another way of comparing numbers 6. Putting ratios to work 7. Problem situations and mathematical sentences Evaluation material 8. Comparing numbers graphically	A) Read and discuss material on mathematical sentences . It is important that students understand that only when an unknown in a sentence is replaced by a numeral do we obtain a statement. The resulting statement will be true or false. The original statement was neither . B) Have students work in small groups or individually with teacher help at the board.
VII. Measurement 1. What is measurement? 2. Man selects standard unit measures 3. Accuracy of measurement 4. The Metric system of measurement Evaluation material 5. Angles Supplemental material Evaluation material 6. Properties of triangles and quadrilaterals. Supplemental material 7. Measurement of regions 8. Circles Evaluation material 9. What's inside	A) A basic idea necessary for understanding measurement should be introduced. When we obtain a measurement, we are attempting to match a discrete set of unit measures to a continous thing. This might be described in a broad sense as attempting to count something that is noncountable. B) Have students work independtely or in small groups with teacher help.
VIII. The Rational Numbers 1. The negative numbers 2. Addition of rational numbers 3. Subtraction of rational numbers 4. Multiplication of rational numbers 5. Division of rational numbers 6. Solution or truth sets	A) By discussion and individual reading, students should solve the problems in this unit. Some reteaching may be needed for individuals. B) Have students work together in small groups or individually.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Advancing in Mathematics pp. 217-256	A) Pupils communicate math ideas by English sentences and learn that a group of symbols written in a certain order is a math sentence. Pupils realize that problems involving math relationships must be read and analyzed carefully in order to be translated into math sentences B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) Advancing in Mathematics pp. 259-313 B) Hand rulers (inches) Ruler (metric system) String Cardboard (flat and cylindrical) Protractor Yardstick	A) Students should establish that measurement is the counting of a discrete set of unit measures. Pupils exhibit a knowledge of the need for standards of measure. Students should be able to measure perimeter of polygons, areas of regions, measures of angles, measures of circumferences, diameters and radii of circles, and measures of volume of rectangular prisms. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) Advancing in Mathematics pp. 3-45 vol. 3 teachers' manual	A) Students should increase computational skills by solving the four fundamental operations using rational numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device

Concepts	A) Teaching Methods B) Learning Acitvities
IX. Symmetry and Congruence 1. Balance in geometric figures 2. Point symmetry investigations 3. Sets of points 4. Regular inscribed polygons 5. Correspondence and congruence 6. Congruent triangles 8. Straightedge and compass	A) In this part we extend the student's experience with geometric relations and geometric figures by building on intuitive concepts. from earlier parts. Background for this topic is provided by investigation of physical objects that possess a particular characteristic called balance. B) Student should work with teacher in small groups or individually.
X. Properties of Expressions 1. Mathematical expressions 2. Simplifying sum or difference forms 3. Polynomials 4. Multiplication in the system of expressions 5. Proof- a reasonable explanation 6. More about simplyifying expressions 7. Division in the system of expressions	A) Expressions are important in mathematics because they are useful in putting our thoughts into mathematical sentences. Equations and inequalities often have the additional advantage of making the structure of a situation easier to see. B) Have the students work in small groups or individually with the teacher.
XI. Equations and Inequalities 1. Tools for problem solving 2. Transforming equations 3. Solving equations 4. Solving inequalities 5. The addition properties 6. Simplifying to solve sentences 7. English and mathematical sentences 8. Sentences with unknowns on both sides	A) We should begin developing systematic techniques for solving equations and inequalities. In the course of developing these techniques we acquire four new concepts. In this unit we have occasion to make use of virtually everything we know about the system of rational numbers. B) Have students work in groups or individually with teacher.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Advancing in Mathematics pp. 49-91 vol. 3 teachers' manual	A) Students relay the concept of line symmetry as it applies to physical objects and geometric figures. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) Advancing in Mathematics pp. 95-144 vol. 3 teachers' manual	A) Students are able to express concepts by a mathematical expression. Students are provided practice in determining the set of values an expression can have for a given set of rational numbers. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) Advancing in Mathematics pp. 147-198 vol. 3 teachers' manual	A) Students should be able to compute the results to problems involving equations and inequalities. Students develop an ability to use English phrases and sentences that express mathematical ideas. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XII. Squares and Square Roots 1. Pythagorean Triples 2. Triples and triangles 3. The Pythagorean Theorem 4. Principle square root 5. Intervals 6. Determining approximate square roots 7. Terminating and repeating decimals 8. Translating decimals into fractions 9. Closing gaps in the number line	A) An informal but meaningful introduction to the system of real numbers. The first topic introduces the concept of an ordered number triple whose elements are positive integers Next we introduce the concept of a perfect square. B) Work with students individually or in small groups.
XIII. Similarity 1. Scale drawings 2. Similar figures 3. Proving triangles to be similar 4. The tangent of an acute angle 5. The sine and cosine of an angle	A) The study of scale drawings leads naturally to the consideration of geometric figures that have the same shape but not the same size. Thus to the concept of similarity. The student learns that two triangles are similar if there is a correspondence between them such that the corresponding angles are congruent and the ratios of the measure of the corresponding sides are equal. Then introduce the assumption that two triangles are similar if two angles of one are congruent to two angles of the other. B) Work with students individually or in small groups.

A) Printed B) Audio Visual Resources C) People D) Places	A) Expected Outcome Evaluation B) Testing Program
A) Advancing in Mathematics pp. 201-246 vol. 4 teachers' manual	A) Students should realize that each point on the number line has exactly one real number coordinate and, conversely, that each real number is the coordinate of a unique point on the number line. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.
A) Advancing in Mathematics pp. 249-284 vol. 4 teachers' manual	A) Students learn how to calculate approximate values for the tangent, sine, and cosine of such angles by using measurements obtained from carefully constructed diagrams. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

Concepts	A) Teaching Methods B) Learning Activities
XIV. The Coordinate Plane 1. Ordered Pairs 2. Variables and ordered pairs 3. Graphing sets of ordered pairs 4. Graphing solution sets	A) Have students try to learn to think of matchings of elements of two sets in terms of ordered pairs. Use graphs to represent ordered pairs and matching. Also use ordered pairs in naming the solution sets of equations in two unknowns. Introduce variables and a dependent variable. In order to graph correspondences between sets of numbers, introduce the concept of a Cartesian coordinate system. B) Work with students individually or in small groups.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Advancing in Mathematics pp. 287-313 vol. 4 teachers' manual	A) Students show that a matching can be thought of as a set of ordered pairs. Students show how graphs can ba used to represent sets of ordered pairs. Students use the concepts of independent variable and dependent variable of an equation in studying mathematical sentences that describe problem situations. B) Administer suggested quiz at the end of this unit or substitute teacher-made testing device.

READING COMMUNITY SCHOOLS

CURRICULUM GUIDE

MATHEMATICS

HIGH SCHOOL

SUGGESTED TIME ALLOTMENTS

	ALGEBRA I	ALGEBRA II/TRIGONOMETRY	GEOMETRY
FIRST QUARTER	1) Symbols and Sets (6)	1) Sets of Numbers and Axioms (10	1) Lines and Angles (5)
	2) Variables and Open Sentences (9)	2) Open Sentences in One Variable (10)	2) Inductive and Deductive Reasoning (12)
	3) Axioms, Equations and Problem Solving (13)	3) Systems of Linear Open Sentences (12)	3) Constructions (5)
	4) The Negative Numbers (12)	4) Polynomials and Factoring (10)	4) Triangles (17)
	5) Equations, Inequalities and Problem Solving (10)	5) Rational Numbers and Expressions (13)	5) Parallel and Perpendicular Lines (18)
SECOND QUARTER	6) Working with Polynomials (14)	6) Relations and Functions (12)	6) Polygons (17)
	7) Special Products and Factoring (15)	7) Irrational Numbers and Quadratic Equations (15)	7) Areas of Polygons (13)
	8) Working with Fractions (17)	8) Quadratic Relations and Systems (15)	
	Semester Exams	Semester Exams	Semester Exams

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SUGGESTED TIME ALLOTMENTS			
	ALGEBRA I	ALGEBRA II/TRIGONOMETRY	GEOMETRY
THIRD QUARTER	9) Graphs (16) 10) Sentences in Two Variables (17) 11) The Real Numbers (17)	9) Exponential Functions and Logarithms (10) 10) Progressions and Binomial Expansion (10) 11) Polynomial Functions (10) 12) Matrices and Determinants (10) 13) Permutations, Combinations and Probability (10)	8) Circles, Angles and Arcs (10) 9) Measurement of Angles and Arcs (10) 10) Loc: (10) 11) Proportion (7) 12) Similar Polygons (12)
FOURTH QUARTER	12) Functions and Variation (10) 13) Quadratic Equations and Inequalities (15) 14) Geometry and Trigonometry (15) Review (5)	14) Trigonometric Functions and Complex Numbers (15) 15) Trigonometric Identies and Formulas (15) 16) The Circular Functions and Their Inverses (15)	13) Regular Polygons and the Circle (5) 14) Inequalities (6) 15) Coordinate Geometry (18) 16) Trigonometry (7)
	Semester Exams	Semester Exams	Semester Exams

SUGGESTED TIME ALLOTMENTS

	PRE-ALGEBRA MATH	TRIGONOMETRY/ANALYTIC GEOMETRY	ADVANCED SENIOR MATHEMATICS
FIRST QUARTER	1) Numeration Systems (15)	1) Trigonometric Functions of Angles (15)	1) Sets & Numbers (5)
	2) Operating with Base 7 and Base 2 (20)	2) Fundamental Relations (10)	2) The Algebra of Numbers as a Logical System (5)
	3) Divisibility, Factoring, and Sets (10)	3) Functions of Two Angles (15)	3) Extensions of the Logic of Algebra (15)
	4) Whole Numbers and Operations (10)	4) Solution of Triangles (15)	4) Inequalities, Absolute Values and Coordinate Systems (7)
			5) Functions and Their Graphical Representation (8)
			6) Linear and Quadratic Equations (10)
SECOND QUARTER	5) Rational and Irrational Numbers of Arithmetic (15)	5) Vectors (5)	7) Determinants (10)
	6) Percent and Its Uses (20)	6) Line Values of the Trig. Graphs (10)	8) Polynomial Functions (12)
		7) Polar Coordinates (10)	9) Permutations, Combinations and the Binomial Expansion (13)
		8-9) Logarithms (10)	
	Semester Exams	Semester Exams	Semester Exams

SUGGESTED TIME ALLOTMENTS

	PRE-ALGEBRA MATH	TRIGONOMETRY/ANALYTIC GEOMETRY	ADVANCED SENIOR MATHEMATICS
THIRD QUARTER	7) The Real Numbers of Arithmetic (15) 8) Directed Numbers - Addition and Subtraction (20) 9) Directed Numbers Multiplication and	10) Functions (5) 11) Coordinates and Graphs (5) 12) The Straight Line (10) 13) Conic Sections (15) 14) Curve Tracing (5) 15-16) Polar Coordinates and Locus Problems (5)	10) Analytic Preparation (8) 11) Plane Analytic Geometry (13) 12) Functions (9) 13) Limits (8) 14) Derivatives
FOURTH QUARTER	Division (20) 10) Basic Geometric Figures (15) 11) Areas and Volumes (10) 12) Line and Circle Constructions (10) Semester Exams	17) The Derivative (10) 18) Differentiation of Algebraic Functions (10) 19) Applications of the derivative (10) 20) Integration (10) Semester Exams	of Algebraic Functions (15) 15) Applications (10) 16) Integration (12) 17) Applications of the Definite Integral (15) Semester Exams

Concepts	A) Teaching Methods B) Learning Activities
Pre-Algebra Math	
I. Numeration Systems -The decimal numeration system -Place values of basic numerals -Egyptian numeration system -Roman numeration system -Positional system -Exponential notation -An abacus and the base-ten system -Abacus for base seven -Adding and subtracting, base seven -From base ten to base seven	A) The teaching methods used in pre-algebra math include: 1) Lecture and demonstration. 2) Involving the student through various projects which relate to the unit being studied. 3) Working in small groups to assist those who are having difficulty. B) Student activities include: 1) Working assigned problems. 2) Keeping a homework notebook. 3) Projects which illustrate the concepts of the lesson.
II. Base Seven and Base Two -Multiplication tables -Base seven multiplication table -Division, base seven -Multiplication table and division -The binary numeration system -Addition and subtraction, binary numeration system -Multiplication, binary system -How many digits in a numeral? -Positional numeration systems	A) &) Refer to chapter 1 B)
III. Divisibility, Factoring and Sets -Divisibility of whole numbers -Divisors of whole numbers -Factors and prime numbers -Complete factorization -Sets -Finite and infinite sets -The empty set -Operations with sets -Greatest common factor -Least common multiple	A) &) Refer to chapter 1 B)

A) Printed B) Audio Visual Resources C) People D) Places	A) Expected Outcome Evaluation B) Testing Program
A) Text: Pre-Algebra Mathematics Nichols Holt, Rinehart & Winston. Text: Chapter 1	A) Students are expected to demonstrate a functional understanding of numeration systems whether decimal or other. B) Teacher-made test
A) Text: Chapter 2	A) Students should demonstrate the ability to perform the fundamental operations in different number bases. B) Teacher-made test
A) Text: Chapter 3	A) Students should exhibit the ability to distinguish between prime and composite numbers, to factor composite numbers, and to find the lowest common multiple and the greatest common factor. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
IV. Whole Numbers and Operations	
-The number zero	A)
-The number one	&) Refer to chapter 1
-The commutative properties	B)
-The associative properties	
-The left distributive property	
-A mathematical deduction or derivation	
-Closure	
-Addition and subtraction as inverse operations	
-Multiplication and division as inverse operations	
-How to solve problems	
V. Rational and Irrational Numbers of Arithmetic	
-Natural numbers and rational	A)
numbers of arithmetic	&) Refer to chapter 1
-The arithmetic mean	B)
-Numbers between two given numbers	
-Comparing rational numbers of arithmetic	
-Reciprocals	
-Terminating decimal numerals	
-Non-terminating repeating decimal numerals	
-Distributive properties	
-Non-repeating, non-terminating decimal numerals	
VI. Per Cent and Its Uses	
-What does %(per cent) mean?	A)
-Per cents and decimal names	&) Refer to chapter 1
-Per cent and rational numbers	B)
-Ratio	
-Ratio and per cent	
-Proportion	
-Discount	
-Commission	
-Per cents less than one	
-Per cent of change	

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 4	A) Students should demonstrate a functional knowledge of the commutative, associative, distributive, and closure properties of the number system. B) Teacher-made test
A) Text: Chapter 5	A) Students should demonstrate a functional knowledge of the difference between rational and irrational numbers, and how to compute arithmetic means. B) Teacher-made test
A) Text: Chapter 6	A) Students should exhibit computational skills in solving all types of per cent problems. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
VII. Real Numbers of Arithmetic -Square root of a number -Real numbers of arithmetic -Pythagorean triples -The property $a^2 + b^2 = c^2$ -Rational numbers and the ray -Ray and irrational numbers -The complement of a set -One-to-one correspondence -One-to-one correspondence between two infinite sets	A) &) Refer to chapter 1 B)
VIII. Directed Numbers - Addition and Subtraction -Number line and one-to-one correspondence -Integers -Directed real numbers -Uses of directed numbers -Adding directed numbers -Absolute value -Commutativity of addition -Associativity of addition -Relation between addition and subtraction of directed numbers -Closure of sets of directed numbers	A) &) Refer to chapter 1 B)
IX. Directed Numbers - Multiplication and Division -Properties of multiplication of directed numbers -The left and right distributive properties -Multiplication and division of directed numbers -Reciprocals and division -Dividing by multiplying	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 7	A) Students should demonstrate comprehension of the basic elements of set theory and the ability to compute square roots. B) Teacher-made test
A) Text: Chapter 8	A) Students should exhibit computational skills in adding and subtracting of signed numbers. B) Teacher-made test
A) Text: Chapter 9	A) Students should demonstrate the ability to multiply and divide signed numbers accurately. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
X. Basic Geometric Figures -Points and segments -Polygons -Half-lines and rays -Angles -Measure of segments and angles -Classification of triangles -Interiors of angles -Simple closed curves -Building geometric objects out of points -Interiors of triangles	A) &) Refer to chapter 1 B)
XI. Areas and Volumes -Rectangles -Triangles -Parallelograms -Regular polygons -Equilateral triangles -Regular polygons and circles -Inscribed hexagons -Inscribed regular polygons -Prisms -Cylinders -Pyramids -Cones	A) &) Refer to chapter 1 B)
XII. Line and Circle Constructions -Half-lines, rays and angles -Midpoints -Constructing angles -Angle bisector -Inscribed angles -Ratio and geometry -Similar polygons -Similar triangles -Ratios in similar triangles -Angles inscribed in semi-circles -Constructing line segments -Distance from a point to a line -Perpendiculars -Central angles	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 10	A) Students should demonstnate a working knowledge of the basic principles of Euclidian geometry. B) Teacher-made test
A) Text: Chapter 11	A) Students should exhibit skills in computing areas and volumes of the more common geometric figures. B) Teacher-made test
A) Text: Chapter 12	A) Students should demonstrate proficiency in constructing the elementary geometric figures, and a functional knowledge of ratios in triangles. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
Algebra I	
I. Symbols and Sets Numbers and Their Relationships -Representing numbers on a line: Order relations -Comparing numbers:the sign of equality -Comparing numbers: the signs of inequality Grouping Numbers in Sets and Subsets -Meaning of membership in a set -Kinds of sets -The graph of a set -How subsets relate to sets Using Numbers in One or More Operations -Punctuation marks in algebra -Order of operations	A) The basic teaching methods used in Algebra I are: 1) teacher explanation and demonstration; 2) students working at the board with individual help; 3) use of various audio-visual aids such as: films, filmstrips, transparencies, and the chalkboard. B) The suggested learning activities are: 1) students working assigned problems at their desks with 2) keeping a notebook of class notes and assignments; 3) individual work from the programmed supplement provided with the text; 4) have students help each other with problems. Refer to the teachers' manual, pp. 6-8 for more suggested teaching methods. For suggested student assignments refer to the teachers' manual pp.48
II. Variables and Open Sentences Analyzing Algebraic Statements -Evaluating algebraic expressions containing variables -Identifying factors, coefficients, and exponents -Solving open sentences Problems Solved With Variables -Thinking with variables: from symbols to words -Thinking with variables: from words to symbols -Solving problems with open sentences	A) Use methods 1-3 as indicated in chapter 1. Refer to the teachers' manual pp. 8-10. B) As indicated in chapter 1. For suggested assignments, refer to teachers' manual, pp. 48-49.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Modern Algebra, Structure and Method Programmed practice to accompany the above text. B) Filmstrips, transparencies as available Chalkboard, various math models C) Teacher, other members of the department	A) Students demonstrate comprehension that: 1) the number line orders the numbers of arithmetic; 2) a set is determined by its elements; 3) the size or complexity of a numeral does not indicate the size of the number represented; 4) in a one-to-one correspondence, each element of a set is paired with an element of the other set, and that no element is omitted or repeated. B) Administer progress and/or teacher-made tests and quizzes as required. Observation of students.
A) Text: Chapter 2	A) Students should exhibit understanding of: 1) the steps involved in the algebraic solution of problems; 2) the concept of a variable; 3) the basic concept of "factor". B) Use provided progress test and/or teacher-made test. Observation.

Concepts	A) Teaching Methods B) Learning Activities
III. Axioms, Equations, and Problem Solving Identifying and Using Number Axioms -Axioms of equality -The closure properties -Commutative and associative properties of arithmetic numbers -The distributive property; special properties of 1 and 0 Transforming Equations With Equality Properties -Addition and subtraction properties of equality -Division and multiplication properties of equality -Combining terms and using transformation principles -Equations having the variable in both members	A) Refer to chapter 1 for methods. B) The learning activities are as indicated in chapter 1. For further methods and suggested assignments, refer to the teachers' manual, pp. 10-13 and 49-50.
IV. The Negative Numbers Extending the Number Line -Directed numbers -Comparing numbers Operating With Directed Numbers -Addition on the number line -The opposite of a directed number -Absolute value -Adding directed numbers -Subtracting directed numbers -Multiplying directed numbers -Dividing directed numbers -Averages and directed numbers (optional)	A) Refer to chapter 1. See also teachers' manual pp. 13-17. B) Refer to chapter 1. For assignments, see teachers' manual, pp. 50-51.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 3	A) Students should manifest a clear understanding of: 1) the formal axioms and postulates of algebra; 2) the necessity for clear and concise mathematical language; 3) the basic methods employed in formal proofs. B) Use progress test and/or teacher-made test. Observation.
A) Text: Chapter 4	A) Students should demonstrate the ability to perform the basic operations with the directed numbers. B) Progress tests and/or teacher-made tests Observation

Concepts	A) Teaching Methods B) Learning Activities
V. Equations, Inequalities, and Problem Solving Open Sentences in the Set of Directed Numbers -Transforming equations -The properties of inequality -Pairs of inequalities (optional) The Analysis of Problems -A plan for solving problems -Problems about consecutive integers -Problems about angles -Uniform motion problems -Mixture problems	A) Refer to chapter 1, and to the teachers' manual pp. 18-22. B) See chapter 1. For assignments, see teachers' manual pp. 51-52.
VI. Working With Polynomials Addition and Subtraction of Polynomials -Adding polynomials -Subtracting polynomials Multiplication of Polynomials -The product of powers -The power of a product -Multiplying a polynomial by a monomial -Multiplying two polynomials -Problems about areas -Powers of polynomials Division of Polynomials -The quotient of powers -Zero as an exponent(optional) -Dividing a polynomial by a monomial -Dividing a polynomial by a polynomial	A) Refer to chapter 1 and to pp. 22-25 of the teachers' manual. B) Learning activities as indicated for chapter 1. For suggested assignments see pp. 52-54 of the teachers' manual.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 5	A) Students should display: 1) understanding of the transitive, additive, and multiplicative properties of inequality; 2) the ability to solve linear equations; 3) the ability to set up and solve problems. B) Due to the inherent difficulty of this material, testing should cover smaller blocks of material in the form of quizzes. A chapter test may be used also. Observation.
A) Text: Chapter 6	A) The students should demonstrate competence in the fundamental operations on algebraic polynomials. B) In this area also, quizzes should be given covering each of the areas of competence in dealing with polynomials. The progress tests may also be used. Observation.

Concepts	A) Teaching Methods B) Learning Activities
VII. Special Products and Factoring The Distributive Property in Factoring -Factoring in algebra -Identifying common factors -Multiplying the sum and difference of two numbers -Factoring the difference of two squares Quadratic Trinomials -Squaring a binomial: plateau section -Factoring a trinomial square -Multiplying binomials at sight -Factoring the product of binomial sums or differences -Factoring the product of a binomial sum and a binomial difference -General method of factoring quadratic trinomials Extension of Factoring -Combining several types of factoring -Working with factors whose product is zero -Solving polynomial equations by factoring -Using factoring in problem solving	A) Refer to general methods outlined in chapter 1, and to pp. 25-28 of the teachers' manual. B) As indicated in chapter 1. Suggested assignments are given on pp. 54-55 of the teachers' manual.

A) Printed
B) Audio Visual
Resources C) People
D) Places

A) Text: Chapter 7

A) Expected Outcome
Evaluation B) Testing Program

A) The students should display an understanding of the various types of factoring as evidenced by their ability to successfully factor these types.
B) Short quizzes, teacher-made and progress tests should comprise the testing of this section.
Observation.

Concepts	A) Teaching Methods B) Learning Activities
VIII. Working With Fractions Fractions and Ratios -Defining algebraic fractions -Reducing fractions -Ratio -Per cent and percentage problems Multiplying and Dividing Fractions -Multiplying fractions -Dividing fractions -Fractions involving multiplication and division Adding and Subtracting Fractions -Combining fractions with equal denominators -Adding fractions with unequal denominators -Mixed expressions -Complex fractions (optional) Fractions in Open Sentences and Problems -Open sentences with fractional coefficients -Investment problems -Per cent mixture problems -Fractional equations -Work problems -Motion problems	A) Refer to methods indicated in chapter 1 and to pp. 28-31 of the teachers' manual. B) See chapter 1 for learning activities. Suggested assignments are outlined on pp. 55-57 in the teachers' manual.

A) Printed
B) Audio Visual
Resources C) People
D) Places

A) Text: Chapter 8

A) Expected Outcome
Evaluation B) Testing Program

A) The students should exhibit a clear understanding of algebraic fractions. They should be able to perform the basic operations with fractions with a high degree of accuracy.
B) Use progress tests to supplement teacher-made tests and quizzes.
Observation.

Concepts	A) Teaching Methods B) Learning Activities
IX. Graphs Ordered Pairs of Numbers and Points in a Plane -Open sentences in two variables -Coordinates in a plane Linear Equations and Straight Lines -The graph of a linear equation in two variables -Slope of a line -The slope-intercept form of a linear equation -Determining the equation of a line Inequalities and Special Graphs -Graph of an inequality in two variables -Graphs that are parabolas Statistical Graphs -Broken-line and bar graphs -Circle graphs	A) Methods as outlined in chapter 1. Further suggestions on pp. 31-33 of teachers' manual. B) As indicated for chapter 1. Suggested assignments on pp. 57-59 of teachers' manual.
X. Sentences in Two Variables Solving Systems of Linear Open Sentences -The graphic method -The addition and subtraction method -Problems with two variables -Multiplication in the addition and subtraction method -The substitution method -Graphs of pairs of linear inequalities (optional) Additional Problems -Digit problems -Motion problems -Age problems -Problems about fractions	A) See chapter 1 for teaching methods. More suggestions may be found on pp. 33-35 in the teachers' manual.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 9 B) Graph board	A) Students should demonstrate the ability to: 1) represent points, lines, and regions graphically; 2) graphically solve linear equations and inequalities in two unknowns; 3) determine the slope of a line and the equation, given the slope and the "y" intercept. B) Progress tests and teacher-made tests Observation
A) Text: Chapter 10 B) Graph board	A) Students should manifest: 1) an understanding of simultaneous linear equations in two unknowns; 2) the ability to solve two equations in two unknowns by graphing, adding and subtracting, and substitution. B) Progress tests and teacher-made tests Observation

Concepts	A) Teaching Methods B) Learning Activities
XI. The Real Numbers The System of Rational Numbers -The nature of rational numbers -Decimal forms of rational numbers Irrational Numbers -Roots of numbers -Properties of irrational numbers -Geometric interpretation of square roots Radical Expressions -Multiplication, division, and simplification of radicals -Addition and subtraction of radicals -Multiplication of binomials containing radicals -Radical equations	A) See chapter 1 for suggested methods. Also refer to teachers' manual, pp. 35-37. B) Suggested learning activities outlined in chapter 1. Possible assignments can be found on pp. 60-62 of teachers' manual.
XII. Functions and Variation Selecting Pairs of Numbers -Relations -Functions Variation -Direct variation and proportion -Inverse variation -Joint variation and combined variation (optional)	A) As indicated in chapter 1. See also the teachers' manual, pp. 37-40. B) See chapter 1. Suggested assignments, pp. 62-63 in teachers' manual.
XIII. Quadratic Equations and Inequalities General Methods of Solving Quadratic Equations -The square-root property -Checking solution sets -Completing a trinomial square -The quadratic formula -The nature of the roots of a quadratic equation (optional) The Solution of Quadratic Inequalities -Solving quadratic Inequalities -Using graphs of equations to solve inequalities (optional)	A) See chapter 1 and pp. 40-43 of teachers' manual. B) Outlined in chapter 1. Suggested assignments on pp. 63-64 of teachers' manual.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 11	A) Students should exhibit: 1) a functional understanding of the system of rational numbers and irrational numbers; 2) the ability to simplify the various forms of radical expressions; 3) a basic knowledge of radical equations including the solution thereof. B) Use progress tests and teacher-made tests as needed. Observation.
A) Text: Chapter 12	A) Students should demonstrate: 1) the ability to differentiate between relation and function; 2) an understanding of the types of variation. B) Teacher-made test and progress tests Observation
A) Text: Chapter 13	A) The students should exhibit: 1) the ability to solve quadratic equations by the various methods; 2) an understanding of quadratic inequalities. B) Progress tests and teacher-made tests Observation

Concepts	A) Teaching Methods B) Learning Activities
Geometry	
I. Lines and Angles -Undefined terms -Definitions -Constructions	A) The teaching methods in geometry include: 1) Teacher lecture, demonstration 2) Proving theorems at the blackboard 3) Using audio visual aids as available. B) The learning activities of the students include: 1) Working assigned problems at desks with teacher assistance 2) Keeping a notebook of class notes and assigned problems 3) Working in teams at the board
II. Inductive and Deductive Reasoning -Discovering information by observation, measurement and experiment -Distinguishing between inductive and deductive reasoning -Basic assumptions -Proof in geometry -The formal proof	A) &) Refer to chapter 1 B)
III. Constructions -The formal procedure in a geometric construction -The nine basic constructions	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Plane Geometry Welchons, Krickenberger, and Pearson Ginn and Company. Text: Chapter 1	A) Students should demonstrate that they know the definitions covered in the chapter. B) Quizzes and teacher-made tests
A) Text: Chapter 2 & 3	A) Students should illustrate: 1) that they can distinguish between deductive and inductive reasoning; 2) a working usage of the basic assumptions; 3) the ability to set up a formal proof. B) Quizzes and teacher-made tests
A) Text: Chapter 6	A) Students should be able to perform the basic geometric construction. B) Teacher-made constructions test

Concepts	A) Teaching Methods B) Learning Activities
IV. Triangles -The basic types of triangles -The concept of congruence -Proving triangles congruent by side-angle-side and angle-side-angle -Prove theorems 1-5	A) &) Refer to chapter 1 B)
V. Parallel and Perpendicular Lines -Theorems 6-16 -Converses, inverses, and contrapositives -Symmetry -Planes and introductory solid geometry	A) Refer to chapter 1 Use solid models to demonstrate and aid introduction to solid geometry B) Refer to chapter 1
VI. Polygons -Theorems 17-29 -Applications of theorems to practical problems	A) &) Refer to chapter 1 B)
VII. Areas of Polygons -Theorems 30-37 -Radicals and quadratic equations -Finding the areas of irregular polygons -volumes of geometric solids	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 4	A) Students should show: 1) the ability to distinguish among the types of triangles; 2) an understanding of congruence; 3) the ability to prove triangles congruent; 4) that they can prove theorems formally. B) Teacher-made tests
A) Text: Chapter 5	A) Students should demonstrate a mastery of: 1) the proof of the formal theorems; 2) the converse, inverse and contrapositive of a theorem; 3) the various types of symmetry, B) Teacher-made tests
A) Text: Chapter 7	A) Students should exhibit the ability to: 1) distinguish among the types of polygons; 2) prove the formal theorems related; 3) apply the concepts in the theorems to problem solving. B) Teacher-made tests and quizzes
A) Text: Chapter 8	A) Students should be able to: 1) prove the theorems in the chapter; 2) apply the concepts to problem solving; 3) find the areas of irregular polygons by the trapezoidal method. B) Teacher-made tests and quizzes

Concepts	A) Teaching Methods B) Learning Activities
VIII. Circles, Angles, and Arcs -Assumptions relating to circles -Theorems 38-47 -Solid geometry a) right circular cylinder b) right circular cone c) sphere	A) &) Refer to chapter 1 B)
IX. Measurement of Angles and Arcs -Theorems 48-52 -Numerical relations between the arcs of a circle and the angles associated with a circle	A) &) Refer to chapter 1 B)
X. Loci -Locus of points -Introduction to the basic conic sections -Theorems 53-60	A) &) Refer to chapter 1 B)
XI. Proportion and Proportional Line Segments -Basic theorems of proportion -Proportion as related to triangles -Theorems 61-64	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 9	A) Students should show the ability to: 1) prove the theorems and apply the concepts; 2) recognize and work with the concepts related to the solid geometry figures discussed. B) Quizzes and teacher-made tests
A) Text: Chapter 10	A) Students should demonstrate the ability to: 1) prove and apply the formal theorems; 2) solve problems related to the arcs and angles of a circle. B) Short quizzes are best in this chapter.
A) Text: Chapter 11	A) The students should demonstrate the ability to: 1) determine a locus from a set of conditions; 2) prove the locus theorems; 3) recognize the basic conic sections from their locus definitions. B) Teacher-made tests
A) Text: Chapter 12	A) Students should demonstrate a a working knowledge of: 1) the basic proportion properties; 2) the proportional division of triangles. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
XII. Similar Polygons -Theorems 65-78 -Using similar polygons in proving line segments equal or proportional	A) &) Refer to chapter 1 B)
XIII. Regular Polygons and the Circle (Optional) -A brief overview of the relations between the circle and polygons	A) &) Informal discussion and lectures B)
XIV. Inequalities -Relations between unequal line segments and angles -Theorems 89-101	A) &) Refer to chapter 1 B)
XV. Coordinate Geometry -Using algebraic methods in geometry -The straight line -Distance between two points -Graphs of linear equations -The conic sections: circle parabola ellipse hyperbola	A) Due to the inherent difficulty in this area, the teacher should take care to explain thoroughly the concepts outlined. This area should be emphasized as it is very important. B) Board work and working in pairs on the concepts.
XVI. Elements of Trigonometry -The basic trigonometric functions -Solving triangles	A) Refer to chapter 1 B) Refer to chapter 1 Practical experience in determining distances by indirect measurement. Construct basic transits for indirect measurement.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 13	A) Students should manifest a functioning comprehension of the interrelation of similar polygons and proportional lines. B) Teacher-made test
A) Text: Chapter 14	A) The students should demonstrate a familiarity with the concepts discussed. B) None required
A) Text: Chapter 16	A) Students should show the ability to work with inequalities. B) Teacher-made test
A) Text: Chapter 17 Analytic Geometry and an Introduction to Calculus, Schock & Warshaw Prentice-Hall Chapters 3 & 4 (Available from department Chairman)	A) Students should demonstrate a working knowledge of the various aspects of the concepts outlined. B) Teacher-made tests
A) Text: Chapter 15 B) Student constructed transits	A) Students should show the ability to solve triangles using trigonometric functions. B) Teacher-made tests Practicals

Concepts	A) Teaching Methods B) Learning Activities
Algebra II and Trigonometry I. Sets of Numbers; Axioms Sets in Algebra -Sets and their relationships -Sets and variables Axioms for Real Numbers -Order in the set of real numbers -Properties of addition and multiplication -Identity and inverse elements Using Axioms -The concept of Proof -Adding and Subtracting real numbers -Multiplying and dividing real numbers	A) The basic teaching methods used in Algebra II/ Trig. are: 1. Teacher explanation and demonstration 2. Students working at the board with individual help 3. Use of Audio Visual aids such as filmstrips, films, math models, transparencies, and the chalkboard. B) Learning activities include: 1. Students working assigned problems at desks with help available. 2. Keeping a notebook of class notes and homework. 3. Having better students assist those students with problems. 4. Students working at the board. The teachers' manual has more detailed suggestions in this area.
II. Open Sentences in One Variable Equivalent Expressions -Algebraic expressions -Simplifying expressions Equivalent Open Sentences -Equivalent equations -Equivalent inequalities -Combining open sentences -Statements and conversee Using Variables to Solve Problems -Interpreting algebraic expressions and sentences -Solving problems	A) &) Refer to chapter 1 and B) teachers' manual
III. Systems of Linear Open Sentences Linear Equations and their Graphs -Open sentences in two variables -Graphs of linear equations in two variables Lines and their Equations -The slope of a line -Determining an equation of a line -Systems of two linear equations in two variables Linear Inequalities	A) &) Refer to chapter 1 and B) teachers' manual

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Modern Algebra and Trigonometry Houghton Mifflin chapter 1 B) Film: Introduction to Irrational Numbers F.O.M.	A) Students should show ability to work with field axioms and order relations in the real number system. B) Teacher-made and/or progress tests
A) Text: chapter 2 B) Film: Introduction to Functions F.O.M. # 1126	A) Student should exhibit skills in in solving linear equations and inequalities in one variable. B) Progress test and/or teacher-made tests
A) Text: chapter 3	A) Students should demonstrate the ability to solve two equations in two unknowns by the usual methods. B) Teacher made and/or progress tests

Concepts	A) Teaching Methods B) Learning Activities
IV. Polynomials and Factoring Products of Polynomials -Positive integral exponents -Multiplying polyonomials Factoring -Factoring monomials -Factoring polynomials -Factoring quadratic trinomials -Greatest common factors and least common multiples of polynomials Factoring in Open Sentences -Using factoring to solve equations -Using factoring to solve inequalities Division of Polynomials -Dividing polynomials -The Factor Theorem (optional)	A) &) Refer to chapter 1 and B) teachers' manual
V. Rational Numbers and Expressions Extension of Laws of exponents -Zero and negative exponents Operations with fractions -Rational algebraic expressions -Simplifying rational expressions -Multiplication and division -Addition and subtraction -Complex fractions Using Fractions to solve Problems -Fractional coefficients -Problems involving fractions -Fractional equations Decimals; Scientific Notation -Decimals for rational numbers -Approximations	A) &) Refer to chapter 1 and B) teachers' manual

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 4	A) Students should exhibit a mastery of the formal techniques of calculating with polynomials and the standard factoring procedures B) Progress test and teacher made tests.
A) Text: chapter 5	A) Students should demonstrate the ability to perform the operation with rational numbers and rational algebraic expressions. B) Progress tests and teacher made tests.

Concepts	A) Teaching Methods B) Learning Activities
VI. Relations and Functions Specifying Relations and Functions -Relations -Functions Linear Functions and Relations -Linear functions and direct variation -Special functions and relations (optional) Quadratic Functions & Relations -Quadratic functions and variation -Quadratic functions specified by $y=ax^2 + bx + c$ -Quadratic functions specified by $y=a(x-h)^2 + k$ -Using graphs of quadratic functions	A) &) Refer to chapter 1 and B) teachers' manual
VII. Irrational Numbers and Quadratic Equations Real Roots of Real Numbers -Using radicals to express roots -Rational and irrational roots -Rational operations -Decimals for real numbers Working With Radicals -Properties of radicals -Simplifying sums of radicals -Products of sums containing radicals Radicals in Equations -Using radicals to solve quadratic equations -Relations between roots and coefficients of a quadratic equation -The nature of the roots of a quadratic equation -Solving quadratic inequalities -Irrational equations	A) &) Refer to chapter 1 and B) teachers' manual

A) Printed B) Audio Visual Resources C) People D) Places	A) Expected Outcome Evaluation B) Testing Program
A) Text: chapter 6 B) Film: Quadratic Equations and their their Solutions F.O.M. #1114 Introduction to Functions F.O.M. #1126	A) Students should illustrate the successful grasp of the concept of function. B) Progress tests and teacher made test.
A) Text: chapter 7	A) Students should be able to perform the operations with radicals and the solution of quadratics. B) Progress tests and teacher made tests

Concepts	A) Teaching Methods B) Learning Activities
VIII. Quadratic Relations and Systems Coordinates and Distance in a Plane -Distance between points -Perpendicular lines(optional) Graphing Quadratic Relations -Circles -Parabolas -Ellipses -Hyperbolas -Inverse variations Solving Quadratic Systems -Graphic solutions -Linear quadratic systems: substitution -Quadratic-quadratic systems	A) &)Refer to chapter 1 and B) teachers' amnual
X. Progressions and Binomial Expansions Arithmetic Progressions -Arithmetic progressions -Arithmetic means -Sum of an arithmetic progression Geometric Progressions and Series -Geometric progression -Geometric means -Geometric series -Infinite geometric series Binomial expansions -Powers of binomials -The general binomial expansion	A) &)Refer to chapter 1 and B) teachers' manual
IX. Exponential Functions and Logarithms From Exponents to Logarithms -Rational numbers as exponents -Real numbers as exponents -Exponential and Logarithmic functions Using Logarithms -Common logarithm Interpolation -Products and quotients -Powers and roots -Combined operations -Using logarithms to solve equations	A) &) Refer to chapter 1 and B) teachers' manual

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 8 B) Film: The Parabola F.O.M. Model of a cone (dissectable)	A) Students should demonstrate comprehension in the basic methods of analytic geometry. B) Teacher made and progress tests
A) Text: chapter 13 B) Film: Arithmetic Series F.O.M.	A) Students should demonstrate a mastery of arithmetic and geometric series. B) Teacher made and progress tests.
A) Text: chapter 9 B) Film: Exponents and Logarithms F.O.M. #1117	A) Students should exhibit the ability to compute and use logarithms in computation. B) Teacher made and progress tests.

Concepts	A) Teaching Methods B) Learning Activities
XI. Polynomial Functions Polynomial Functions over the Complex Numbers -Synthetic substitution -Remainder and factor theorems -Depressed equations -The fundamental theorem of Algebra Polynomials with Real Coefficients -Descartes' Rule -Graphing -Location Principle -Upper and lower bounds for roots -Polynomials and linear interpolation	A) &)Refer to chapter 1 and B) teachers' manual
XII. Matrices and Determinants Matrices -Terminology -Addition and scalar multiplication -Matrix multiplication -The determinant function -2x2 Matrices -The inverse of a matrix -Solution of systems of linear equations Determinants -Expansion by minors -Properties of determinants -Cramer's Rule	A) &)Refer to chapter 1 and B) teachers' manual
XIII. Permutations, Combinations and Probability Permutations -Fundamental counting principles -Linear and circular permutation -Permutations of elements the same Combinations -Counting subsets -Those formed from several sets -Binomial Theorem and Pascal's Triangle Probability -Sample spaces and events -Meaning of math probability -Mutually exclusive events -Independent and dependent events	A) &) Refer to chapter 1 and B) teachers' manual

Resources	Evaluation
A) Printed B) Audio Visual C) People D) Places	A) Expected Outcome B) Testing Program
A) Text: chapter 14	A) The students should have a working knowledge of the algebra of real numbers and complex numbers B) Progress tests
A) Text: chapter 15	A) Students should exhibit a computational ability in solving determinents. B) Teacher made tests.
A) Text: chapter 16	A) Students should demonstrate a mastery of the elementary notions used in counting and in probability. B) Progress tests.

Concepts	A) Teaching Methods B) Learning Activities
XIV. Trigonometric Functions and Complex numbers Coordinates and Trigonometry -Rays and angles and points -Sine and cosine functions -The trigonometric functions -Special angles Evaluation and applying trigonometric functions -Using tables -Logarithms of the values of Trigonometric functons -Reference angles Vectors -Adding vectors -Resolving vectors Working with Complex Numbers -Complex Numbers -Multiplying pure imaginary numbers -Complex numbers and quadratic equations	A) &) Refer to chapter 1 and B) teachers' manual
XV. Trigonometric Identities and Formulas Identities and One Angle -The Fundamental identities -Proving identities Identities Involving Two Angles -The distance formula -The cosine of the difference of two angles -Functions of sums and differences of angles -Double and Half angle identities -Sum and product identities Triangle applications -The Law of cosines -The Law of Sines -Solving triangles -Areas of Triangles	A) &) Refer to chapter 1 and B) teachers' manual

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 10 B) Film: Law of Cosines F.O.M. #1125	A) Students should demonstrate a working knowledge of the basic trignometric functions. B) Progress tests
A) Text: chapter 11	A) The students should exhibit the ability to work with the basic trig. identities. B) Progress tests

Concepts	A) Teaching Methods B) Learning Activities
XVI. The Circular Functions and their Inverses Variation and Graphs -Measuring arcs and angles -The circular functions -Graphs of Cosine ans Sine functions -Graphs of other circular functions Inverse Functions and graphs -Inverse values -Inverse circular functions Open Sentences -General and particular solutions -Additional sentences	A) &) Refer to chapter 1 and B) teachers' manual

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 12	A) The students should manifest a clear understanding of the graphs of the trig. functions. B) Progress tests

Concepts	A) Teaching Methods B) Learning Activities
Trigonometry/Analytic geometry	
I. Trigonometric Functions of Angles	A) The teaching methods for trigonometry do not vary noticeably from other mathematics disciplines, i.e. 1) lecture; 2) students working assigned problems at their seats; 3) discussion; 4) individual help as required. B) Suggested learning activities include: 1) students keep a notebook of class notes and assigned exercises; 2) working problems at the board; 3) students helping each other to better understand.
II. Fundamental Relations	A) &) Refer to chapter 1 B)
III. Functions of Two Angles	A) &) Refer to chapter 1 B)
IV. Solution of Triangles	A) &) Refer to chapter 1 B) B) Have students construct siple line of sight transits.

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Modern Trigonometry Welchons, Krickenberger, & Pearson Ginn & Company. Text: Chapter 2	A) Students should demonstrate a working knowledge of the functions of the angles including special angles. B) Teacher-made test
A) Text: Chapter 6	A) Students should exhibit a thorough competency in solving problems involving the fundamental identities. B) Teacher-made tests
A) Text: Chapter 7	A) Students should demonstrate the skills to solve the more complex identities involving two angles. B) Teacher-made test
A) Text: Chapter 8	A) Students should show the skills necessary for the solution of triangles. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
V. Vectors	A) &) Refer to chapter 1 B)
VI. Line Values and Graphs of Trigonometric Functions	A) &) Refer to chapter 1 B)
VII. Polar Coordinates	A) &) Refer to chapter 1 B)
VIII. Approximate Numbers and Logarithms	A) &) Refer to chapter 1 B)
IX. Solution of Triangles by Logarithms	A) &) Refer to chapter 1 B)
X. Functions	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 1	A) Students should demonstrate the ability to solve vector problems using trigonometric functions. B) Teacher-made test
A) Text: Chapter 3	A) Students should demonstrate the ability to graph the various trigonometric functions. B) Teacher-made test
A) Text: Chapter 4	A) Students should show the ability to convert freely between rectangular and polar coordinates. B) Teacher-made test
A) Text: Chapter 12	A) Students should manifest a computational skill in logarithms. B) Teacher-made test
A) Text: Chapter 14	A) Students should indicate the ability to solve triangles by means of logarithms. B) Teacher-made test
A) Text: Analytic Geometry and an Introduction to Calculus, Schock & Warshaw Prentice-Hall. Text: Chapter 1	A) The students should demonstrate a working knowledge of the concept of a function. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
XI. Coordinates and Graphs	A) &) Refer to chapter 1 B)
XII. The Straight Line	A) &) Refer to chapter 1 B)
XIII. Conic Sections	A) &) Refer to chapter 1 B)
XIV. Curve Tracing	A) &) Refer to chapter 1 B)
XV. Polar Coordinates	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 2	A) Students should exhibit a functional understanding of the rectangular coordinate system. B) Teacher-made test
A) Text: Chapter 3	A) Students should be able to solve problems involving all aspects of the straight line. B) Teacher-made test
A) Text: Chapter 4	A) Students should exhibit a functional knowledge of the conic sections. B) Teacher-made test
A) Text: Chapter 5	A) Students should be able to plot the curves of various algebraic functions, including logarithmic, exponential and absolute value. B) Teacher-made test
A) Text: Chapter 6	A) Students should demonstrate the ability to perform conversions, transformations, and rotation of axis, with polar and rectangular coordinates. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
XVI. Locus Problems (Optional)	A) &) Refer to chapter 1 B)
XVII. The Derivative	A) &) Refer to chapter 1 B)
XVIII. Differentiation of Algebraic Functions	A) &) Refer to chapter 1 B)
XIX. Applications of the Derivative	A) &) Refer to chapter 1 B)
XX. Integration	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: Chapter 7	A) Students should show familiarity with the basic locus theorems. B) Teacher-made test
A) Text: Chapter 8	A) Students should show: 1) basic understanding of limits; 2) the ability to find the derivative by the delta method. B) Teacher-made test
A) Text: Chapter 9	A) Students should be able to find the derivatives of the primary algebraic functions. B) Teacher-made test
A) Text: Chapter 10	A) Students demonstrate the ability to use the derivative in the solution of practical problems. B) Teacher-made test
A) Text: Chapter 11	A) Students should be able to find certain indefinite integrals and to apply definite integrals to simple problem solving. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
Advanced Senior Math	
I. Sets and Numbers -Sets and basic notation -Subsets -Operations on sets -Integers -Rational and irrational numbers -Equality	A) The teaching methods in advanced senior math are: 1. lecture and demonstration; 2. discussion. B) The learning activities include: 1. working assigned problems at desks; 2. presenting assigned problems to the class. The first semester covers concepts which the students have seen prior to this course. These concepts are presented, however, in greater depth. The teacher may find that he is able to move with some rapidity and in some cases finish ahead of schedule. The difficult concepts in the second semester may then be given greater time.
II. The Algebra of Numbers as a Logical System 1. The deductive system 2. The real numbers 3. Certain basic theorems 4. Further theorems	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Modern College Algebra Vance- Addison-Wesley Chapters 1&2	A) Students are expected to demonstrate a grasp of the concepts reviewed here. B) Teacher-made testing device
A) Text: chapters 1&2	A) See above

Concepts	A) Teaching Methods B) Learning Activities
III. Extensions of the Logic of Algebra -Addition of algebraic expressions -Multiplication of algebraic expressions -Division of algebraic expressions -Special products -Factors and factoring -Simplification of fractions -Addition of fractions -Multiplication and division of fractions -Integral and zero exponents -Rational exponents -Radicals -Addition and subtraction of radicals -Multiplication and division of radicals	A) &) Refer to chapter 1 B)
IV. Inequalities, Absolute Values and Coordinate Systems -Order axioms for the real numbers -A one-dimensional coordinate system -The completeness property -A two-dimensional coordinate system -The distance formula	A) &) Refer to chapter 1 B)
V. Functions and Their Graphical Representation -Functions and relations -Graphical representation of functions and relations -Graphical representation of empirical data	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 3	A) Students should demonstrate a thorough working knowledge of the basic concepts of algebra. B) Teacher-made test
A) Text: chapter 4	A) Students should exhibit the ability to set up a logical system of coordinate algebra. B) Teacher-made tests
A) Text: chapter 5	A) Students should manifest the ability to discriminate between a function and a relation. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
VI. Linear and Quadratic Functions -The linear function -Arithmetic progressions -The quadratic function -Solution of the quadratic equation -Inequalities -Relations between zeros and coefficients of the quadratic function -Equations in quadratic form -Equations involving radicals -Variation -Solution of two linear equations -Algebraic solution of three linear equations -Solution of one linear and one quadratic equation	A) &) Refer to chapter 1 B)
VII. Determinants -Determinants of order two and three -Determinants of order n -Expansion of a determinant by minors -Solution of a system of linear equations by determinants	A) &) Refer to chapter 1 B)
VIII. Polynomial Functions -Certain theorems -Graphing of polynomial function -General remarks on zeros and roots -Rational roots -Irrational roots	A) &) Refer to chapter 1 B)
IX. Permutations, Combinations, and the Binomial Theorem -The fundamental principle -Permutations -Combinations -The binomial theorem -The expansion of $(1+x)^2$	A) &)Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 6	A) Students should display a functional understanding of the quadratic function. B) Teacher-made test
A) Text: chapter 7	A) Students should exhibit the ability to solve determinants of order two & three. B) Teacher-made test
A) Text: chapter 8	A) Students should demonstrate the skill to determine the roots of various degree equations B) Teacher-made tests
A) Text: chapter 10	A) Students should manifest the necessary skills required in permutations, combinations and probability. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
X. Analytic Preparation -Introduction -Coordinates -Directed distance -Slope of a straight line -Inequalities -Absolute value -Absolute values of sums, products, quotients, and differences -Intervals and neighborhoods -Equations of straight lines	A) The teacher should procede from this point in the course with deliberation. The material is quite difficult for high school students. Any true understanding of the concepts will be of great value to the college bound student. Keep in mind that it is better to cover less material better than a lot of material poorly. The teaching methods are essentially the same: 1) lecture & demonstration 2) discussion.
XI. Plane Analytic Geometry -Curves and equations -Tangents and normals -Newton's method for approximating roots of equations -Distance between two points -The circle -The parabola -The ellipse -The hyperbola -Second degree curves -Invariants and the discriminant -Sections of a cone -Curve fitting using determinants	A) At the teacher's option, certain references to the calculus may be omitted during the study of this chapter for later presentation.
XII. Functions -Introduction -What is a function? -Equal functions. Functions of more than one variable. -Ways of combining functions -Slope of a curve -Derivative of a function -Velocity and rates	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Elements of Calculus and Analytic Geometry Thomas Addison-Wesley Text: chapter 1	A) Students are expected to demonstrate knowledge of the basics of Analytics. B) Teacher-made test
A) Text: chapter 11	A) Students should exhibit a comprehensive understanding of the concepts of Plane Geometry. B) Teacher-made test
A) Text: chapter 2	A) Students should exhibit the ability to solve problems dealing with all phases of functions. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
XIII. Limits -Definition of a limit of a function -Theorems about limits -More theorems about limits -Infinity	A) &) Refer to chapter 1 B) Note: The concept of a limit is vital to a true understanding of the calculus and care should be taken in the presentation.
XIV. Derivatives of Algebraic Functions -Polynomial functions and their derivatives -Rational functions and their derivatives -Implicit relations and derivatives -The increment of a function -The chain rule for derivatives -The differentials dx and dy.	A) &) Refer to chapter 1 B)
XV. Applications -Sign of the first derivative . Application to curve sketching. -Related rates -Significance of the sign of the second derivative -Curve plotting -Maxima and minima theory -Maxima and minima problems -Rolle's Theorem -The Mean Value theorem	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 3	A) Students should demonstrate a thorough working knowledge of the theory of limits. B) Teacher-made test
A) Text: chapter 4	A) The students should demonstrate the ability to differentiate the algebraic functions. B)Teacher-made test
A) Text: chapter 5	A) Students should exhibit the ability to apply the derivative. B) Teacher-made test

Concepts	A) Teaching Methods B) Learning Activities
XVI. Integration -Introduction -The indefinite integral -Applications of indefinite integration -Brief review of trigonometry -Differentiation and integration of sines and cosines -Area under a curve -Computation of areas as limits -Areas by calculus -The definite integral and the Fundamental Theorem of integral calculus -The trapezoidal rule for approximating an integral -Some comments on notation -Summary	A) &) Refer to chapter 1 B)
XVII. Applications of the Definite Integral -Introduction -Area between two curves -Distance -Volume -Approximations -Length of a plane curve -Area of a surface of revolution -Average value of a function -Moments and center of mass -Centroid and center of gravity -Work	A) &) Refer to chapter 1 B)

Resources A) Printed B) Audio Visual C) People D) Places	Evaluation A) Expected Outcome B) Testing Program
A) Text: chapter 6	A) Students should show the ability to find both indefinite and definite integrals. B) Teacher-made test
A) Text: chapter 7	A) Students should demonstrate the ability to apply the definite integral to various problems. B) Teacher-made test